Gauging the degree of success of TOKTEN -a UNDP-Government of India Umbrella Project

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This is to certify that the thesis entitled "Gauging the degree of success of TOKTEN-a UNDP-Government of India Umbrella Project" submitted by M K Dhirendra Rao ID. No. 1999PHXF001 for award of Ph.D. degree of the Institute embodies original work done by him under my supervision.

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Abbreviations

ACT	Activated Carbon Technology
ADA	Aeronautical Development Agency
ADE	Aeronautical Development Establishment
AIIMS	All India Institute of Medical Sciences
AMU	Aligarh Muslim University
AOTF	Acousto-Optic Tunable Filter
APCTT	Asian and Pacific Centre for Transfer of Technology
ASRT	Academy of Scientific Research & Technology
ASSOCHAM	The Associated Chambers of Commerce and Industry of India
BARC	Bhabha Atomic Research Centre
BHEL	Bharat Heavy Electricals Ltd.
BHU	Banaras Hindu University
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
C-DAC	Centre for Development of Advanced Computing
C-MMACS	CSIR Centre for Mathematical Modelling & Computer Simulation
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
CAT	Centre for Advanced Technology
CBT	Centre for Biochemical Technology
CCMB	Centre for Cellular & Molecular Biology
CD-ROM	Compact Disc-Read Only Memory
CDRI	Central Drug Research Institute
CEER	Centre for Electrochemical and Energy Research
CEERI	Central Electronics Engineering Research Institute
CFB	Centre for Biochemicals
CFTRI	Central Food Technological Research Institute
CGCRI	Central Glass and Ceramic Research Institute
CIDA	Canadian International Development Agency
CII	Confederation of Indian Industry
CIS	Commonwealth of Independent States
CLRI	Central Leather Research Institute
CMERI	Central Mechanical Engineering Research Institute
CMRS	Central Mining Research Station
COSTED	Committee on Science & Technology in Developing Countries
CPRI	Central Power Research Institute
CRRI	Central Road Research Institute
CSIR	Council of Scientific & Industrial Research
CUL	Carborundum Universal Ltd
DANIDA	Danish International Development Agency

DBT	Department of Biotechnology
DEA	Department of Economic Affairs
DNA	Deoxyribonucleic Acid
DMRL	Defence Metallurgical Research Laboratory
DSA	Daily Subsistence Allowance
DST	Department of Science and Technology
EC	European Commission
EU	European Union
ENRECA	Enhancement of Research Capacity in Developing Countries
FICCI	Federation of Indian Chamber of Commerce and Industry
GIL	Gas India Ltd
GLC	Gas Liquid Chromatography
GMP	Good Manufacturing Practice
GOI	Government of India
HAU	Haryana Agricultural University
HPLC	High Performance Thin Layer Chromatography
HRD	Human Resource Development
HTS	High Throughput Screening
HPC	High Powered Selection Committee
IACS	Indian Association for Cultivation of Science
ICGEB	International Centre for Genetic Engineering and Biotechnology
ICT	Information and Communication Technology
IOC	Indian Oil Corporation
IDPL	Indian Drugs and Pharmaceuticals Ltd
IIM	Indian Institute of Management
IICB	Indian Institute of Chemical Biology
IICT	Indian Institute of Chemical Technology
IIP	Indian Institute of Petroleum
IIT	Indian Institute of Technology
IISc	Indian Institute of Science
IMTECH	Institute of Microbial Technology
INSA	Indian National Science Academy
INRIST	Interface for Non Resident Indian Scientists and Technologists
IPFT	Institute of Pesticides Formulation Technology
IPR	Intellectual Property Right
ISAC	ISRO Satellite Centre
ISI	Indian Standards Institute
ISI	Indian Statistical Institute
ISM	Indian School of Mines
ISRO	Indian Space Research Organization
ISTAD	International Science & Technology Affairs Directorate

IT	Information Technology
ITRC	Industrial Toxicology Research Centre
JICA	Japan International Cooperation Agency
JNCASR	Jawaharlal Nehru Centre for Advanced Scientific Research
JNMC	Jawaharlal Nehru Medical College
KIBS	Knowledge Intensive Business Service
KASSIA	Karnataka Small Scale Industries Association
L&T	Larson & Toubro Limited
LRDE	Electronics & Radar Development Establishment
MBA	Master of Business Administration
MEIID	Mobilising Expatriate Indians for Industrial Development
MNC	Multinational Company
MNES	Ministry of Non-Conventional Energy Sources
MOU	Memorandum of Understanding
NAL	National Aerospace Laboratories
NCCBM	National Council for Cement and Building Materials
NCCS	National Centre for Cell Science
NCL	National Chemical Laboratory
NCMRWF	National Centre for Medium Range Weather Forecasting
NCTC	National Committee for Technology Transfer
NGO	Non-Government Organization
NIO	National Institute of Oceanography
NISCAIR	National Institute of Science Communication and Information Resources.
NML	National Metallurgical Laboratory
NPC	National Project Coordinator
NPD	National Project Director
NPL	National Physical Laboratory
NRDC	National Research Development Corporation
NRI	Non-resident Indian
NTPC	National Thermal Power Corporation Ltd.
OSCs	Overseas Singapore Clubs
PGIMER	Post-graduate Institute of Medical Education & Research
PIARC	Permanent International Association of Road Congress
PIO	People of Indian Origin
PPC	Programme Policy Committee
PSC	Programme Steering Committee
PV	Padma Vibhushan
R&D	Research and Development
RRL	Regional Research Laboratory
RTD	Research and Technological Development
RTTT	Re-Transfer of Technology to Turkey

SAARC	South Asian Association for Regional Cooperation
SAC	Space Application Centre
SAIL	Steel Authority of India Ltd.
SAARC	South Asian Association for Regional Cooperation
SAMEER	Society for Applied Microwave Electronics Engineering and Research
S&T	Science and Technology
STIO	Scientists and Technologists of Indian Origin (STIO)
SERC	Structural Engineering Research Centre
SME	Small and Medium Enterprise
SOP	Standard Operating Procedure
SPO	State Planning Organization
SSPL	Solid State Physics Laboratory
SSRC	Syrian Scientific Research Centre
STAR	Senior Technical Advisor Recruitment
STAS	Short-Term Advisory Service
STIO	Scientists and Technologists of Indian Origin
TCDC	Technical Cooperation among Developing Countries
TF	Task Force
TIFAC	Technology Information, Forecasting and Assessment Council
TIFR	Tata Institute of Fundamental Research
TLC	Thin Layer Chromatography
TOKTEN	Transfer of Knowledge through Expatriate Nationals
TPR	Tripartite Review
TUBITAK	The Scientific and Technical Research Council of Turkey
UDCT	University Department of Chemical Technology
UGC	University Grants Commission
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
UNU	United Nations University
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UNISTAR	United Nations International Short Term Advisory Resource
UNOPS	United Nations Office for Project Services
UNV	United Nations Volunteers
USA	United States of America
VLSI	Very Large Scale Integration
WTO	World Trade Organization

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Chapter 1

Introduction

1.1. Preface

The acronym TOKTEN stands for Transfer of Knowledge through Expatriate Nationals (TOKTEN). The United Nations Development Programme (UNDP) floated this as a scheme, first in Turkey in 1976, to attract the top class Turkish expatriates to seek their support for short periods of time to accelerate the pace of the ongoing development in Turkey. Expatriate national's love for their motherland, cultural and linguistic affinities and their knowledge of home country provided a great impetus to this scheme. TOKTEN became so popular at a relatively low investment that it spread over 30 developing countries such as Bangladesh, China, Egypt, Iran, Liberia, Philippines, Ukraine and Vietnam in a short span of time [Moroto, Ikuko; 1998].

The TOKTEN- India was established in March 1980 as a joint initiative of the Government of India and the United Nations Development Programme (UNDP). It gradually picked up considerable momentum and continued until June 2001 [Chitnis, V T; 2002]. Under the programme, distinguished scientists, technologists, management experts and other non-resident Indian (NRI) professionals were invited to serve their motherland complimentarily as short-term Consultants on specific, pre-determined assignments. Academic and R&D institutions, public sector and private sector enterprises (particularly small and medium industries), industrial associations, and non-government organizations (NGOs) were the visible beneficiaries of their knowledge. The principal beneficiary organization, in a given case, usually hosted a TOKTEN expert, who also visited varying number of other beneficiary organizations, as per demand, and availability.

It was natural for the TOKTEN scheme to undergo changes from time to time to be able to respond to national need patterns. Initially the TOKTEN focused on requisitioning the expert advice of expatriate nationals, chiefly for the

benefit of Indian R&D and academic institutions. Subsequently it expanded to meet the demand for managerial, technical and marketing advisory services to the industrial enterprises. Eventually, in 1995, it was, of necessity, unified with two other concurrent programmes, namely, the United Nations International Short Term Advisory Resource (UNISTAR) and Technical Cooperation among Developing Countries (TCDC) to unleash their latent synergistic potential. The unified programme came to be known as TOKTEN Umbrella Project under spotlight in this thesis.

The first 7 years of TOKTEN in India (1980-87) were essentially the period of progress through learning on the job. The subsequent three phases during the operative periods 1987-90, 1990-95 and 1995-2001 registered substantial improvements to infuse new life to the programme. The decision-making process leading to necessary structural changes in the programme gathered its strength from periodic evaluations and reviews. The evaluation committees in 1987,1990 and 1995 studied all facets of the ongoing TOKTEN programme in great detail and furnished their reports making some far-reaching recommendations. When implemented, the changeover from supply push' to 'demand pull', adoption of the Umbrella concept that weaves the TOKTEN (1980), United Nations International Short Term Advisory Resource (UNISTAR) and Technical Cooperation among Developing Countries (TCDC), and the added spotlight on sustainability initiatives became obvious.

1.2. TOKTEN in the context of International S&T Cooperation in India

The vehicle of scientific progress, and therefore of economic prosperity of a country, is necessarily propelled by International Cooperation. In olden days, the road to progress was straight and smooth. The expectations from international cooperation in the developing countries like India were rather modest, and most of what happened fitted into *donor-recipient relationship* between the countries of the North and the South. Then came the period of *institutional capacity building*, which, *inter alia*, threw up many world-class Centres of Excellence.

Developing countries, which had by then acquired maturity, preferred bilateral international cooperation to include joint projects and programmes, based on synergy of strengths of partner countries. In such cases, joint project formulation was generally achieved through exploratory visits and through joint workshops and symposia. In the mean time, forces of globalization took hold and changed the rules of the game for all forms of international cooperation. They, however, also offered unprecedented opportunities for those who would take the attendant challenges. Marginalisation still seems certain for those who would not.

The face of International Cooperation in Science & Technology has changed from time to time, but more dramatically in the recent years. There was a time when developing countries mostly received direct support out of sympathy or gratis, merely as dole. Whenever and wherever the need arose, direct help was rushed by the affluent North to solve this or that specific problem of the trailing South. This form of aid made countries of the so-called 'third world' critically dependent on the developed ones and is not totally in line with the spirit of International Cooperation. This donor-recipient trend of International Cooperation gradually changed as the developing countries realized its futility and became more conscious of the need for self-reliance. They demanded shift of focus from 'direct support' to institutional capacity building.

This change of emphasis made a perceptible difference. Levels of science and technology in many countries of the South went up, skilled manpower position considerably improved, and the scientific institutions so established became Centres for cultivation of science in their respective countries. Many developing countries like India succeeded in creating numerous world class Centres of Excellence. However, two problems arose in the process. Developing countries did not have enough resources to nurture Centres of excellence. And rarely did the international help come beyond a point to protect excellence, perhaps because of the fear of competition in the making. The other problem was of brain drain. The universities and research institutions in the more progressive of the developing world became 'factories' to produce 'brains' at their own national expense eventually to be 'drained' by the affluent countries, for their own advantage.

The point can be illustrated by taking one example from India. The record shows that about 10,000 Indian scholars, in the period 1961-81, did receive their doctorate degrees from the US. And, as it happens, more than 13,000 Indian students enrich American Universities even today. This is because most of these students are among the brightest in the world, as they belong to the creamy layer of the Indian society. For instance, over 1,50,000 students sit for the entrance examination of the Institutes of Technology in India of which only about 4000 are admitted ('Outlook', May 29, 2000). After completing their undergraduate studies in India, most of these students land in the US. A great majority of them stay back in the US and add to its national asset. It is therefore not surprising that with the contributions of this kind coming from a large number of other countries and the effort of the natives, America has bagged more than 200 Nobel Prizes. One could see that the number also includes two of the recent American Nobel Laureates of the Indian Origin. The question is how successful we have been in tapping this talent?

Many of the research publications of the Indian Scientists in America have done honor to the reputed journals such as Nature, Poly. Rev. Ltr., Scientific American, J. of Am. Chem. Soc and others. Since 1970, the US has allowed more legal immigration than the rest of the world combined. And these immigrants constitute some of the best brains; enhancing America's already rich mix of talent. In 1988, US admitted 643000 legal immigrants, more than by all other countries put together. This is one American way of making good the skilled manpower shortfall. We need to at least link with our people, if not get them back.

In the subsequent period, the new forms of cooperation including twinning of the institutions, launching of joint projects, setting of joint laboratories, holding of joint workshops etc flourished. India followed the same approach for which it needed a helping hand of its expatriate nationals.

Besides above, the International Cooperation is also seen as a dire necessity for accelerating the pace of research and development work through pooling of resources, leveraging of capacities, and synergising strengths. Developing

new tools and technologies to promote progress in priority fields of S&T is generally on every national agenda in order to meet national demands, upgrading skills (human resource development), and modernize scientific infrastructure.

Many developing countries seem to be already grappling with the forces of globalization in their quest for survival. Emergence of alliances at regional and sub regional levels has come as a part of their natural defense mechanisms. Association of South East Asian Nations (ASEAN), South Asian Association for Regional Cooperation (SAARC), Centre for S&T in Non Aligned and Other Developing Countries (NAM), Third World Academy of Sciences (TWAS), Federation of Asian Scientific Academies and Societies (FASAS), Commonwealth Science Council (CSC) etc., are some examples. All these organisations endeavour to foster, promote and sustain regional interests of the groupings they represent.

Global alliances also become necessary to address cross border issues like environment, international crime, illegal narcotics and communicable and non-communicable diseases. The Global alliances in Science & Technology were perhaps the easiest to come by, especially because they were born of compelling reasons and they added global visibility to the more powerful partner. Without these alliances, perhaps it would have been beyond the means of a single country to pursue mega projects, be they for solving of a global problem or for satisfying the scientific curiosity and adventurism.

We recall with a sense of satisfaction the Scientific Studies at Antarctica which set a good tradition of International Cooperation in Science & Technology more than four decades ago. A report of the US Congress (1997) lists a number of similar joint global initiatives such as space missions, giant particle accelerators, joint astronomical observations, mapping of human genome and fusion energy. Indian scientists are also participating in some of the high profile scientific studies and experiments. For instance, they are associated with Large Hadron Collider at Geneva, advanced facilities as at the German Research Centre, Juelich, German Aerospace Research Centre, Koln; synchrotron radiation facilities at Spring 8 in Japan and the Italian 2 GeV

Elettra beam line at Trieste in Italy. The list will be very long if one were to consider all areas of Science & Technology. Such collaborations have helped both developed and the developing countries.

It became increasingly clear that successful international cooperations would be those, which get built around the issues that dominate the agenda for the 21st century namely, information technology, biotechnology and environment. Where appropriately conceived with respect for mutuality of interests, and built on the foundation of synergy, trust and flexibility, results of international cooperations could be spectacular for all. Many developing countries like India, with their impressive wealth of human capital and infrastructure base, have the potential to become global R&D platforms, besides serving as most modern *factories* to *churn out* skilled manpower at much lower costs than otherwise possible.

India has a special long-term collaboration with Commonwealth of Independent States (CIS) countries. Each country has its own expertise in specific areas, including technologies, highly trained manpower and facilities. There are potential technologies on which joint work can be taken up for commercialization and mutual sharing of the benefits. However, due to financial constraints in the CIS countries, a different approach is taken in developing joint activities. This includes the requirement of often sharing the financial burden by supplementing funds in their R&D institutions for mutually beneficial R&D [Kulshreshtha, A P; 2000].

Another type of cooperation is with certain group of countries namely European Union (EU) and ASEAN. While the present nature of activities with European Union is more towards providing expertise for EU prioritized projects, efforts are underway to have a bilateral arrangement with EU with the objective of identifying programmes of mutual interest and equal sharing. India being a dialogue partner, cooperation with ASEAN countries-Indonesia, Malaysia and Thailand, is already on an equal sharing basis.

At the regional level, namely the South Asian Association for Regional Cooperation (SAARC), the cooperation modes have generally been in the

organization of joint seminars and workshops, group training and preparation of state-of-the-art reports, rather than on joint R&D. Similar procedure may be adopted in case of cooperation under the aegis of Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC), with major financial inputs expected from a corpus fund, with contributions from participating countries, namely, India, Bangladesh, Sri Lanka, Myanmar, Thailand, Bhutan and Nepal. The focus is more on providing S&T inputs for economy-related activities.

The TCDC aims for growth and equitable development among developing countries, supported by the UNDP fund. The major emphasis of TCDC has been development of human resources and efforts devoted to identifying and addressing issues of common interests, namely those related to impact of globalization. TCDC was thus essentially focusing on exchanging technical resources among the developing countries. The Special Unit of TCDC has added a new dimension of economic cooperation, like trade and investment for South-South sharing.

Cooperation in multilateral mode includes India's participation in country programmes under UNDP auspices; United Nations Educational Scientific Cooperation (UNESCO) related activities pertaining to S&T through Indian national commission; and participation in activities of the NAM S&T Centre.

The Government of India has entered into intergovernmental S&T agreements with many countries of the world. The Department of Science and Technology (DST) of the Government of India service these. The agencies like the Council of Scientific and Industrial Research (CSIR), the Department of Biotechnology (DBT), or the professional societies like Indian National Science Academy (INSA) have also signed several bilateral and multilateral agreements for bolstering cooperation in S&T [TIFAC, 1997].

TOKEN Umbrella programme, though signed only internally between UNDP, Department of Economic Affairs and CSIR in contrast with internationally signed programmes, did play a significant role in fostering, promoting and sustaining international cooperation inasmuch as it opened its doors and

windows to invite synergy with other bilateral S&T programmes. It became possible for TOKTEN experts, TCDC experts and other international experts invited under bilateral S&T programmes to share the same platform and synergies their inputs. For instance, a thematic workshop, besides drawing heavily on the components of TOKTEN, UNISTAR and TCDC, also made good use of the ongoing bilateral S&T Programmes in mobilizing additional expertise for mutual advantage.

The scope of the thesis is limited to study on multi-faceted aspects of TOKTEN while learning from the experiences on other bilateral and multi-lateral S&T cooperation programmes. The ideas developed for gauging the degree of success of TOKTEN is bound to influence monitoring and evaluation of other similar programmes.

1.3. Stimulus for the PhD Proposal

The prime stimulus for the PhD proposal came from the reasons of inquisitiveness about, and the importance and the perceived utility of the research on the subject. TOKTEN, besides being nationally important, was in its twilight period, and yet nothing much was happening at the national level to save it. Whether or not TOKEN resurfaces as a new programme, expatriate Indian nationals will continue to serve their motherland either through their own initiatives or through other bilateral and multi-lateral channels. It was therefore felt necessary to focus on delivery aspect to place the programme in right perspective.

With nearly three decades of history behind it, TOKTEN was generally hailed as a programme of high yield at low investment. Yet it's gains were not adequately documented and projected. Its history, though exciting, was likely to be lost forever in the maze of numerous internal reports, files and papers or gradually fade away in the minds of those associated. It was therefore the time to collect, collate, add and analyze the information in a systematic manner.

Despite being seen as a programme of great potential, very little was done to make use of the feedback and the lessons learned from TOKTEN. On the contrary, there was a real fear that, without a sincere attempt, the ongoing programme may come to an abrupt close. The decision to close the TOKTEN programme seemed more subjective than objective – in the absence of any serious or systematic study of its lights and shadows. What is more, no attempt was within sight to critically assess the cost-effectiveness of the programme before arriving at a verdict on its fate. And it was hard to arrive at an objective assessment or make a case to market the proposal to re-engineer TOKTEN without evolving a rational approach to gauge the degree of success of TOKTEN. Such an effort was necessary also to project the gains and the shortcomings, and learn lessons.

Since its inception in Turkey in 1976, TOKTEN programme had spread to many other countries and was designed to meet their respective national needs. The fact that none of these countries has reported any logically sound approach to measuring degree of success of TOKTEN, provided a further impulse to the choice of the present study. Naturally, the study was poised to add to the culture of programme evaluation and monitoring.

At any point on time, several of the S&T projects are reported to be 'successfully' completed although many fall short of meeting the intended expectations [Varghese P; 2002]. Successful Projects cannot be relatively ranked because of the absence of the criteria to do so. And when funding is tight and new priorities queue up, decisions are made to discontinue even the meaningful projects based on the personal judgment of a few decision-makers. Similarly, only generic reasons like inadequate communication, lack of trust, absence of focus and weak linkages [Sierra de la MC; 1995], could be advanced to explain the shortfall. TOKTEN was perhaps moving on the same road. The often-cited major shortfall was that it was not self-supportive despite three decades of investment.

A systematic study seemed necessary to examine TOKTEN, both in retrospect and prospect in order to project its achievements and shortcomings through a transparent and logical procedure. While the evaluation of cooperative programmes involving universities, research institutions and

industries and also the policies which aim at encouraging cooperation between them have been attempted; evaluation of effectiveness of technical assistance programmes are also known; it was felt that the art of comprehensive approach to gauge the degree of success of bilateral and multilateral R&D cooperative projects needs to be pursued.

Development of an approach for gauging the degree of success of TOKTEN—India Project thus became the central concern of this doctoral work.

1.4. The Present Study

It is observed that the reports of the three joint missions were mostly based on available information and selected interviews. The direct and indirect gains of the programme and its overall impact were not detailed out. Furthermore, real gains of the unified TOKTEN, TCDC and UNISTAR programme pursued in the final phase (1995-2001) remained unknown to many, including some of the decision makers, because no attempt was made either to formally evaluate it or to publicize the gains.

Earlier evaluations and reviews did not spotlight the basic TOKTEN concepts, namely what the founders of TOKTEN call the 'homing instinct' of NRIs, 'Brain gain' from abroad, choice of 'Consultancy' approach against other modes of technology transfer like collaboration, technology licensing, the 'tacitness'- the physical presence of the consultant (subsuming long-distance travel of the consultant), etc. Further, team building and sustenance of contact are not probed. While the programme is reported to have reoriented itself from 'supply push' to 'demand pull', it is imperative to know how it fared as the Umbrella Programme. The present study fills in this gap.

It was difficult to gauge the degree of success of TOKTEN without a systemic performance evaluation of each one of its components and of their synergistic collective impact. This exercise required brainstorming on considerations vital to gauging the success and on a possible user-friendly methodology to deploy

those considerations in arriving at an objective assessment. Then there was the need to recognize the different ways participating partners looked at the same set of outputs.

The implementation problems like procedural delay, shortcomings in follow-up, incorporation of visits to other institutions besides the host institution, optimal duration of visit etc needed examination. The valuations of consultancy, Intellectual Property Right (IPR), networking are the additional issues that required attention.

Even though the TOKTEN—India was implemented for over two decades and has been undergoing changes in the best of the interests of the beneficiaries, and it even metamorphosed in to a new programme—the "Umbrella Project", search for a methodology to gauge the degree of success of TOKTEN—India Project and also the impact of its transformation into Umbrella Project was missing, underscoring the need for the study.

It naturally became necessary to:

1. Study the basic premises of TOKTEN,
2. Place in perspective the historical context of TOKTEN—India Project,
3. Understand the implementation of TOKTEN–India Project and its elements of transformation in to the Umbrella Project,
4. Identify elements that constituted success,
5. Develop a methodology to gauge the degree of success of TOKTEN Umbrella Project, and,

The TCDC and UNISTAR were operating independently in India, parallel to TOKTEN with dispersed efforts. Then came their integration but the independent streams continued concurrently. This fact also needed attention.

The study and the suggested model can be replicated mutatis mutandis in other countries where TOKTEN is being implemented and thus is expected to have multiplier effect.

1.5. Methodology and Data Collection

1.5.1. Methodology

A common platform is developed for consideration of major factors that impact success. The success indicators are categorized under the following.

A) Rating of Activity Planning and Implementation

B) Rating of Operational Efficiency

C) Rating of Impact of the Activity

D) Fulfillment of Administrative Requirements

Umbrella project had at the outset well defined key focus areas identified for organizing its activities which included thematic workshops, round table meetings besides visits to academic institutions and industry (See Figure 1, Chapter 5). Each one of these activities had a well-articulated set of objectives and pinpointed deliverables. The development of a user friendly methodology required revisiting all the various activities carried out during the life span of the umbrella project and rate them according to the weights of their respective outcomes. The results so obtained are then coalesced to gauge the overall success.

In an exercise of this kind, it was not possible to eliminate subjectivity but by attempting to quantify the gains of every activity, subjectivity was cut down to a minimum. For quantifying gains, there was the need to assign scores or weights to each identified indicator of degree of success. Again for achieving objectivity to the extent attainable, an interactive dialogue was developed and scores were arrived at in consultation with some of the most enlightened participating institutions and individuals from the Governmental Departments, UNDP, R&D Laboratories, Universities and Industries associated with the programme, during the period 1997-2001.

1.5.2. Data Collection

Following data sources were utilized for the study.

- Direct interaction with the individuals associated with the Umbrella Project.
- Primary source on the subject matter like the reports submitted by TOKTEN consultants, feedback of host organizations, reports of the National Project Coordinator, Project files.
- Secondary documents like the proceedings of workshops, reports of tripartite review meetings, minutes of meetings on TOKTEN.
- Primary periodicals
- Internet.
- Questionnaire Surveys

Chapter 2

Literature Survey

The overall economy of a country chiefly depends on the manufacturing sector and the services sector. Besides, these sectors also play a decisive role in the developmental process of a country, especially in strengthening linkages and towards a balanced development. In order to give impetus to economic development, it is essential to build scientific and technological capability within the country which includes research and development, upgradation and transfer of technologies, engineering and consultancy services, skill development, sourcing of S&T information and its dissemination.

In the Indian context, about three decades ago, the general situation that prevailed in the service sector was to import technologies for production. This policy approach generated endless need for trouble shooting consultancy activities. Generation of new technologies and adoption and transfer of proven imported technologies were both considered essential for reliable technological base leading to sustainable industrial development. Liberalization policy of the Indian Government in 1991 and globalization of economy provided easier access to resources like free import of latest technologies from abroad, improvement in the supply situation besides, joint ventures and setting up of multinational companies in India [Virmani, B R; 1999]. Firms and organization in India responded to market reforms, liberalization and globalization by improving efficiency, importing technology and by increasing in-house R&D [Bowonder, B; 1999]. Consequently the need for additional foreign consultancy and improved delivery system became necessary.

In its present stage, the Indian economy needs to keep a constant track of the rapid technological advances in developed countries. At the same time, India has

to correct the internal uncompetitive industrial structures and problems of technological obsolescence particularly with reference to small and medium enterprises. The later part of 90's saw the triggering of Knowledge Intensive Business Services (KIBS) relying heavily on professional knowledge weighted towards scientists, engineers and other experts. The KIBS sector includes large part of following services: management consultancy, accounting and book keeping, legal services, technical engineering, some financial services (e.g. securities & stock-market-related activities), R&D consultancies, environmental management etc. which operate in knowledge-intensive environment. (http://les1.man.ac.uk/cric/projects-6.htm). Armed with professional knowledge, the expert consultants tend to be leading users of IT to enhance their client reach.

Managing the technology transfer project objectives is a complex endeavor. This is more so in an international situation as the knowledge suppliers are from advanced countries while the knowledge utilisers are in emerging economies [Nahar, Nazmun; 2001]. There is a whole range of dimensions impacting on success of technology transfer from macro-level of impact on S&T and society as a whole to micro-level issues like the question of absorptive capacity of advanced knowledge by the recipients [Madu, C; 1989]. In this context, understanding the components of a project, the manner in which it is steered, the innovations introduced, value addition realized, monitoring mechanism, the outputs and outcome of the project all are important. The study of success of the project as a whole and the individual blocks that made up the whole are paid special attention considering the topic chosen for the Ph.D. work.

2.1. Measurement of Project Success

A basic question that often arises on completion of any project is, how successful was the project? According to Pinto and Slevin, "there are few topics in the field of project management that are so frequently discussed and yet so rarely agreed upon as the notion of project success" [Pinto, J K; 1987]. And, a common

understanding is that what gets measured is valued and gets on to the road to improvement, establishing the advantage of measurement. *Inter-alia*, the topic throws on to the center-stage the core subject of the Thesis and that concerns the very meaning of success. How does one define success? What is meant by success in measurable terms?

Success would mean differently when viewed through the different prisms of the sponsor, the participating agencies and the beneficiaries. In each case the context defines the content. In broad terms, the success may be taken as synonymous with favourable consequence or positive outcome of an effort or an activity. In the present case, we may equate the favourable consequence with the expectations fulfilled, and the goals netted by a given project or a programme. Success could, therefore, be judged in terms of intended aswell as the unintended benefits to the recipient as seen through the eyes of the organizations charged with the responsibility to judge the degree of success, as also from the point of view of other players.

Earlier literature on measurement of success centers on the success of 'process' and 'product' while speaking of the manufacturing sector. The factors like the 'timely deliveries' and ' exercising fiscal discipline' have remained the basic yardsticks for evaluating projects besides the consideration of 'quality'. Multidimensional approaches have also been deployed for capturing multi-angle view of project success. Currently importance of outputs to a learning organization and flexibility in project design are also being cited as added factors in gauging success. The latest bi-annual Product Development Metrics Survey by Goldense Group, Inc. collected data on the management approaches and metrics used by product research and development centers throughout North America with some input from Europe. It found that while there is a growing move towards structured and formalized management practices and increasing cross functional participation, the vast majority of companies have yet to establish and coherently tie together the metrics, capacity management and project

management systems that are essential for effectively managing a resource and process that is vital to business prosperity (http://proquest.umi.com).

2.1.1. Success measures

Literature survey indicates that the search for critical success factors has been ongoing for the past two decades, from organization level through the project to the product; focusing on the specifics like human resource, internal operations, finance & customer. Although studies of organizational effectiveness have been at the heart of organization theory, research on project success has been slow to converge to a standard, or even an operative framework [Pfeffer, J; 1978]. An obvious approach would be to look for a simplistic approach, such as equating success with meeting the objectives of project within the time and the budget. However, even when these indicators are read together, they give only a partial picture of the degree of success and conclusions so arrived may be deceptive. Baker *et al* argue that projects that meet budget and schedule constraints may be considered successful even though they fall short of customer needs and requirements! [Baker, B N; 1998]. But it is his view, which will be opposed by many.

The assessment of project success may also differ according to the appraiser. A comprehensive success criteria must therefore reflect different interests and views, which lead to the necessity for developing a multidimensional, multicriteria approach. Pinto and Mantel identified three aspects of project performance as benchmarks for measuring the success or failure of a project: the implementation process, the perceived value of the project and client satisfaction with the final product [Pinto, J K; 1990]. Client satisfaction and customer welfare were studied by Paolini and Glaser and Pinto and Slevin [Paoline, A; 1997; Pinto, J K; 1990]. Cooper and Kleinschmidt used factor analysis techniques to identify the success dimensions of a new product [Cooper, R G; 1987]. They discussed three different dimensions as relevant to the success of new products: financial performance,

the window of opportunity and market impact. Thus herein, success encompasses both the current and the future indicators. A similar approach was used by Dvir *et al.* to assess the success of high-tech strategic business units [Dvir, D; 1993]. Further, Freeman and Beale identified seven main criteria to measure project success [Freeman, M; 1992]. Five of these are frequently used: technical performance, efficiency of execution, managerial and organizational implications (mainly customer satisfaction), personal growth and company's ability and business performance.

Lipovetsky *et. al.* used a multidimensional approach to measure the success of various defense projects [Lipovetsky, S; 1997]. Based on previous studies, Freeman defined the following four dimensions of success: meeting design goal, benefits to the customer, benefits to the developing organization and benefits to the defense and national infrastructure. For each project, three different stakeholders (the customer, the developing organization and the coordinating office within the Ministry of Defence) were asked for their views on the relative importance of these dimensions of success. Analysis of the data revealed that benefits to the customer are by far the most important success dimension and the second is meeting design goals. The other two dimensions proved relatively unimportant. Since, by definition, stakeholders are those who stand to gain or lose from the success or failure of a system, their perspectives need to be taken into account in order for a project to be successful [Freeman, R E; 1984].

As may be seen from the foregoing account, literature on success studies of collaborative projects in R&D environment, between two or more persons, institutions, agencies, countries is wanting. In the past the most commonly used measures of the programme's success included the number of joint projects, the funding, the number of collaborators/institutions engaged. While these measures have their place, more meaningful measures that show results needs to be employed, like number of joint publications, patents, centres created, processes commercialized (www.gov.us.fed.congress.record/senate). But these quantitative

evidences are still not wholly acceptable. However, for qualitative measures, we may draw upon the success studies carried out in the context of sociology.

2.1.2. Gauging the success of collaborations

A common practice is to gauge success of collaborative projects in terms of timely implementation and on meeting project objectives. But is that approach alone good enough to measure success? An outcome of interviews with Pew Partners, a civic research organization in Africa, says that, they had come to define success in fundamentally broader ways, which ultimately had everything to do with their ability to learn and make things happen (www.pew-partnership.org/pubs/serendipity/measuring.html).

Success is about more than just seeking to achieve specified targets or reaching a project's bottom-line goal, such as, did the mission succeed in training a certain target group, increase the output of a product, create a certain number of innovative fields of research, recruit the required level of scientists etc. It should be asserted that measuring success must extend well beyond how effective collaboration is in meeting specific targets. It also must cover learning and adjust to the changing situations. One key element in gaining success is to provide flexibility, that is, while the goal stays constant, what it means to get there does not. Thus while the mode of implementation of cooperative programmes should be project-based, their success should be marked by measurable contribution to outcomes. This is the principle followed by the UNDP. (http://stone.undp.org/undpweb/eo/evalnet/Frameworkfinal.pdf).

Thus, quantitative measures are required for guidance and for evaluation of success, after the completion of a project. Care should be taken that the quantitative procedures do not too much dilute the pre-determined measures. It should spotlight fulfilling the collaboration's overall mission. Besides the techniques to address the issues, in the context of measuring success, two key dimensions that need to be kept in mind are the need for a certain mindset, and

the need to create the right ambience in which that mindset can flourish. Finally, a learning organization never rests in the glory of success. It takes a strong sense of vigilance to keep pushing to learn more, to do better, to make a greater difference [Tushman, M L; 1978].

2.1.3. Performance Evaluation of Bilateral and Multilateral Collaborative Projects

The evaluation mechanism of cooperative programmes at the national and international levels involving institutions or their programmes, R&D sectors or disciplines, national R&D system (i.e. at the macro level) or at the level of individual researchers, R&D teams or projects (i.e. at the micro level); and the policies which aim at encouraging cooperation between them are well known. For example, Scientometrics, which endeavours to study the scientific (and technological) system using a variety of approaches, can be used for monitoring even the difficult territories like the health of science, evaluating the effectiveness of national science policies and for strategic analysis (Scientometrics, Vol. 34, No.3, 1995 is devoted to these issues). Further, the scope of evaluation studies have been wide, covering R&D performance, technology development, research outputs, resource allocation, prioritization, product development, impact on market, competitiveness of the firm, etc.

However, the programme evaluations and performance reviews should not be mixed-up with monitoring and performance indicator approaches. This raises some important issues, not the least of which echoes the observation of Luke Georghiou & David Roessner that, valid programme evaluations must, increasingly, account for the context in which they are performed. Science and technology programmes do not exist in a vacuum, either politically or theoretically. The fundamental requirement for the design of a performance indicator regime is a clear understanding of context, goals and the relationships, which link goals to effects [Georghiou, Luke; 2000].

It will therefore be helpful to clarify some of the terms at the outset. The term 'Evaluation' is used for looking back at the past performance of programmes, or something that occurs as they unfold, as in on-going or real-time evaluation. The later is distinct from Monitoring in the sense that, it is less mechanical and more judgmental [Berk, Richard A; 1990]. 'Appraisal', also called 'ex-ante' evaluation, means work done at the beginning of a programme or a project, often at the time of its selection. 'Assessment' covers the integrated activity of appraisal, monitoring and evaluation, as a whole.

Generally, the performance evaluation of research and technological development (RTD) is laden with difficulties. Objectives are often not set as clearly as they should have been. Research results being uncertain, its outcome is diverse and difficult to capture. Moreover, the measurable effects take time, to be visible. Often the important effects are indirect, compounding the difficulty. Besides, research is only one part of the innovation chain and its results can be clouded downstream. Above all these difficulties, the need is for results of evaluation, which are quantifiable and demonstrable. Hence there is a need to constantly improve upon the approaches followed on performance measurement.

2.1.3.1. Performance Evaluation of TOKTEN-India Project

Independent evaluation missions were chosen by the UNDP to review the TOKTEN-India project. The approach followed by the three joint evaluation missions (of the UNDP and the GOI) on TOKTEN-India project was that they collected actual data on the outcome of the project from the hosts, users, Government Ministries and Departments, Industrial associations etc to evaluate the performance and address the question of its continuation for funding by the UNDP. The evaluation reports provided distribution patterns of consultancies evolved by sector, subject, consultants, hosts etc. Further, the missions giving policy directions and recommendations on implementation did qualitative analysis.

The salient recommendations of the first evaluation led by Prof. M C Madhavan of San Diego State University include [UNDP, 1988; UNDP, 1990; UNDP, 1994]:

- consideration of specific problems in R&D projects,
- development of collaborative projects,
- more exhaustive training of researchers in new techniques, and
- knowledge transfer through workshops, seminars and lectures to cover wider audience.

The second evaluation mission led by Prof. A K Sharma of Calcutta University recommended the following:

- establishment of comprehensive databases for identification of experts
- continued interaction with the consultants for lasting benefits.
- change of gear from `supply push' to `demand pull'

The recommendations of the third evaluation mission led by Dr (Ms) J. R. Lobell, President, AcXEL International Ltd, New York were:

- tuning the project to the national development priorities
- visionary Umbrella concept that weaves the TOKTEN (1980), United Nations Short Term Advisory Resource-UNISTAR (1985) and Technical Cooperation among Developing Countries-TCDC (1973), and
- the TOKTEN-India sustainability initiative [UNDP, 1994].

Rao and Rastogi have done an exercise to quantify the contributions made by TOKTEN consultants during their assignments in India for the period 1985-93 in one of the sub-fields, namely, electrical, electronics and computer engineering through 'per-day' weighted impact analysis [Rao, M K D; 2005]. The study brings out the estimated financial value of the consultancies rendered, year of maximum contribution, type of benefit that accrued most to host organisations, field in which the consultants contributed the maximum, impact of experience, age of

consultants on the benefits accrued etc. during the period of study in the sub-field of electrical, electronics and computer science. However, no comparative study has been done with other sub fields during the same period, which would have given better perspective on the contributions.

As may be seen from the foregoing paragraphs, the determinants of project success cannot be generalized and differ from project to project. A visit to specific S&T projects with a view to understanding the approach followed for their evaluation is therefore necessary.

2.2. Evaluation Approaches

Luke Georghiou traces the genesis of evaluation methods to the need to assess the impact of public policies on the linkages (Academy-Industry, Public-Private etc) within the innovation system [Georghiou, Luke; 2000]. Literature on evaluation methods is vast [Fayl, Gilbert; 1998; Averch, H; 1994; Barker, Katharine; Rao, M K D; 2004; Kostoff, R N; 1995]. Some of the methods employed are historical trace study, real-time tracking (Alvey programme), peer review, scientometrics, cost-effective index, input-output analysis, case studies, surveys, literature review, modeling, quantitative analysis of archival data. These were used individually or in combination.

The RAND Corporation, USA (now re-named, S&T Policy Institute) classified evaluation methods into three types [Fayl, Gilbert; 1998].

i Retrospective, historical tracing of knowledge inputs that resulted in specific innovations

ii Measuring research outputs in aggregate from particular sets of activities (e.g. programmes, projects, institutions, fields) using bibliometrics, citation counts, patent counts, compilations of accomplishments etc.

iii Economic theory/econometric methods employing productivity growth, increase in national income, or improvement ins in social welfare etc.

Much of the literature and internet sources are on evaluation of individual project or programme at the Universities Pereira, Julio C R; 1996; Liang, Liming; 2001], Industries [Hills, Philip V; 1995; Okubo, Y; 2000; Smith, W A; 1995], R&D organizations [Bizan, Oded; Monteros, J Espinosa de los; 1996; Kuhlmann, S; 1995; Roessner, J D; 1993] or for policy making [Nahar, Nazmun; 2001]. International technical aid programmes have their evaluation methods as a mandatory requirement for auditing purpose, viz., DANIDA, CIDA, UNDP, etc., which are distilled below.

2.2.1. Project Evaluation by European Commission

The European Commission (EC) has been systematically evaluating its R&D activities, since the early 1980s, by convening meeting of panel of experts for each sub-programme for deliberating upon scientific, socio-economic and managerial aspects [Georghiou, Luke; 2000]. This approach was felt to give the best guarantee of independence while safeguarding the necessary scientific quality of evaluation.

From the beginning, the Commission has promoted its evaluation efforts as a two-fold exercise: a management tool and performance assessment. Evaluation was expected to play a role in the implementation of ongoing activities and to provide input for future policy-making. By the early 1990s, it became clear that the existing evaluation scheme employed by the Commission Services had shortcomings. The outcome of evaluations could not always be translated into appropriate input to the necessary managerial and political decisions [Georghiou, Luke; 2000].

The EC, since 1995, has evolved an improved scheme, based on the following rationale: Appropriate frequency, better harmonization, ensured continuity, maintained independence, more transparency and full democratic accountability.

The foregoing rationale led to a new scheme and since 1995, continuous monitoring, annual reporting and five-year assessments have been adopted [Fayl, Gilbert; 1998]. The output of successive annual monitoring is an importing element for the five-year assessment, which combines an ex, post evaluation of the previous programme, a mid-term appraisal of the ongoing one, and recommendations for future orientation. As the successive multi-annual programmes overlap by one year, there is complete continuity in the evaluation process.

2.2.2. Project Evaluation by Canadian International Development Agency (CIDA)

The Canadian International Development Agency (CIDA) has developed a 'Framework of Results and Key Success factors', under which, performance is measured by comparing actual results with those that were expected to be achieved. CIDA's Framework of Results and Key Success factors provide the criteria for measuring the development by asking some hard questions to the project delivery partners, beneficiaries, and donors, like, why are we doing this project? What results do we expect to achieve for the resources being invested? Who will the project reach out to in terms of beneficiaries? How will progress toward the achievement of results be measured? The Framework involves the preparation of a three row by four column, twelve-cell matrix, as in Table 1.

The Danish International Development Agency (DANIDA) also follows an identical approach for monitoring and evaluation of its programmes (www.um.dk/danida/evalueringsrapporter).

Table 1: The Result-Oriented Logical Framework

Narrative summary	Expected results	Performance measurement	Assumptions/ risk indicators
Project goal The contribution of this project to the central programme objective	**Impact** Long-term developmental results at the societal level	**Performance indicators** Performance indicators that will provide evidence that the project has made a contribution to the achievement of the stated develop-mental impact	**Assumptions-Risk indicators** The necessary conditions that must exist for the cause-effect relationships between outcomes and impact to behave as expected Risk indicators Risk indicators that will measure the status of the assumptions identified above
Project purpose The project objective which addresses the priority development needs of the identified beneficiaries and is achievable within the scope of project activities	**Outcomes** Medium-term development results benefiting an identified target population that are achievable within the timeframe of the logical consequence of achieving a specified combination of outputs	**Performance indictors** Performance indicators that will provide evidence that he project has achieved the stated developmental outcomes	**Assumptions-Risk indicators** The necessary conditions that must exist for the cause-effect relationships between outputs and outcomes to behave as expected Risk indicators Risk indicators that will measure the status of the assumptions identified above
Resource Listing by categories of resources (inputs and/or activities required to achieve the project purpose planned budget for each type of resource and total project budget	**Output** Short-term developmental results produced by or for the benefit of the project delivery partners that are the immediate consequences of project activities and inputs	**Performance indicators** Performance indicators that will provide evidence that he project has achieved the stated developmental outcomes	**Assumptions-Risk indicators** The necessary conditions that must exist for the cause-effect relationships between outputs and outcomes to behave as expected Risk indicators Risk indicators that will measure the status of the assumptions identified above

2.2.3. Project Evaluation by the World Bank

The emphasis of the World Bank is on monitoring its large number of financial assistances the world over. It has developed its appraisal criteria around nine programme aspects, viz., Global (Operational region's), Partnership (Other partners of World Bank), Objectives (Agreed objectives with partners), Activities (Services), Governance & management (Organized functioning), Financing 9dedicated resources), Risks & management, Monitoring & evaluation and External review (www.worldbank.org/oed/gppp).

The monitoring and evaluation criteria in particular cover firstly the establishment of an independent evaluation system for the implementation phase of the programme complying with their standard of best practice. A few of the criteria are listed below.

- Clear project and component objectives verifiable by indicators.
- A structured set of quantitative or qualitative indicators
- Requirements for data collection and management
- Institutional arrangements for capacity-building
- Feedback from monitoring and evaluation to Bank management and the Board

2.2.4. Project Evaluation by UNDP-Government of India

During the period 1980-1994, the monitoring of the TOKTEN programme, under the UNDP-Government of India Project, was essentially through (i) Feedback (summary) report of experts and host organizations; (ii) Reviews, namely, periodical Tripartite Reviews, Terminal Reviews; and, (iii) Evaluation, namely, Internal and External evaluation.

During Phase II of the Project, the technical reports received from the TOKTEN consultants were published under five disciplines:

1. Biosciences and basic Medical Sciences
2. Applied Sciences
3. Engineering & Technology (I)
   (Electrical Engineering)
4. Engineering & Technology (II)
   (Ceramic and Chemical)
5. Engineering & Technology (III)
   (Civil Mechanical & Allied)

These technical reports were sent to the top-level managers and decision makers in the respective disciplines in the government as well as in the industry. The purpose of this exercise was to get the reports evaluated and also to find out what follow-up action can be taken to implement the important suggestions given by the consultants.

The comments received from the referees, to whom these reports were sent, formed a part of the internal review. The outcome was also fed to External evaluators appointed by the UNDP for reviewing the project from their point of view.

However, the feedback reports received from the expert consultants were too technical for any other use. Instead, a gist of major contributions in popular style for wider dissemination could have been useful. Further, an evaluation form could have been designed to elicit specific suggestions on TOKTEN for its improvement from both the Consultants and the Hosts/Users. These inputs could have been authentic source of information for the formal evaluation missions.

Taking note of the in-depth Evaluation Mission of Dr. (Ms.) J R Lobell, the project monitoring mechanism was structured with the formation of the Programme

Policy Committee (PPC), Programme Steering Committee (PSC) and National Project Director (NPD). For this purpose National Project Coordinator (NPC) furnished:

- Monthly progress report vis-à-vis approved targets to NPD.
- Periodic progress report vis-à-vis target to PPC & PSC at every meeting
- Project Performance Evaluation Report (Annual)
- Terminal Report

The UNDP-Government of India Umbrella project had a system of Tripartite Review (TPR) with representation of UNDP (funding agency), Government of India (monitoring agency) and CSIR (implementing agency), during the currency of the project. The Umbrella project had this meeting once every year, in the first quarter [GOI, 1989]. It was a mechanism for joint review of the progress to date and decision-making on mid-course corrections as well as on other aspects of the design and implementation of the project.

The TPR is no longer a corporate requirement of UNDP. There is now a shift in the focus from the concept of an efficient or 'well-managed' project, that is timely in implementation, and true to the action plan to measurable contributions or the 'outcome' of a given project. The policy approach toward outcome emphasizes on building effective partnership and ownership of project.

To sum up, each project needs an approach that suits its context and should conform to best management practice, viz., prescribed by OECD. Conceptually, there is need for a shift in mindset from timely implementation and meeting project objectives (change the 'should happen' attitude). Seeking to measure outcomes is simply futile. Now the emphasis should be to 'notice' realistic and positive feelings of players and should reflect different points of view on specific indicators. Finally, performance evaluation should seek to 'improve' not 'prove'.

2.3. Lessons learnt

As may be seen, CIDA, WB, EC have all their own evaluation approaches and they generally resort to some form of 'logical framework', developed over a period of time. The approaches bring together the elements of a project (inputs & outputs), the operational aspects (resources, activities, outputs) and developmental considerations (purpose & goal) in a logical framework. This is used in planning, execution and evaluation of the programme or project. Ultimately, they emphasize on monitoring the result or the outcome.

TOKTEN was also a UNDP technical assistance programme. While methodology applied by UNDP was to evaluate multi-claimants of its funds, TOKTEN itself had multiple players competing for participation in the programme. The concept is innovatively used in the thesis in development of a user-friendly, transparent and systematic approach can be utilized to gauge the degree of success of any project – big or small (see Chapter 8). Similar to the approaches examined in Section 2.2., the methodology presented for TOKTEN emphasizes evaluation of outcomes of the project, seeking responses of all the players involved in the project, on a pre-designed format.

Chapter 3

TOKTEN- International Experience

3.1. TOKTEN-Characteristics and Distribution

The TOKTEN is unique in concept but varies in form and detail across the globe. The variations are in terms of designs, operational features, monitoring mechanisms, diversifications, etc. According to the UNDP web site www.tokten-vn.org.vn, the countries where the scheme has been most successful (no objective analyses are available) include Turkey, India, China, the Philippines, Poland and Palestine. For example, the first decade of its launch, 261 consultants had undertaken 360 assignments and 700 consultancies, of average five weeks of stay during each visit were reported (www.un.org.tr/undp/tokten.htm). TOKTEN has been evaluated as excellent and cost-beneficial in many countries including India. In Turkey, the average cost of TOKTEN consultants was reportedly half the cost of foreign consultants.

The TOKTEN, as a strategy, is often considered to be for reversal of brain drain. However, TOKTEN can at best provide only partial relief against the loss due to 'Brain Drain'. It, in fact, seeks to mobilize value-added expertise and know-how of expatriate professionals, which will otherwise be lost to the countries they immigrate.

Several schemes akin in philosophy to TOKTEN have co-existed, playing a supplementary role to TOKTEN. The "Scientists' Pool" scheme of India (managed by the Council of Scientific and Industrial Research, New Delhi), the Senior Technical Advisor Recruitment (STAR) Programme of China, Short-Term Advisory Service (STAS) of Guyana, Overseas Singapore Clubs (OSCs) of Singapore and local TOKTEN type programmes of Philippines are some of the striking examples of such schemes. A total of forty-one expatriate knowledge networks, connecting the expatriates amongst themselves and with the country of origin for promoting the exchange of skills and knowledge,

were identified around the world [Meyer, Jean Baptiste; 1999]. The expatriate knowledge networks are tied to 30 different countries, some of them having more than one network. These networks differ in size, scope, objectives, activities and structure. These may be classified in five categories: student/scholarly networks, local associations of skilled expatriates, expert pool assistance through the TOKTEN programme of the UNDP and intellectual/scientific diasporas networks. These expatriate knowledge networks of scientific and technical experts/personnel are listed in Table 2.

Table 2. Network of Scientific and Technical Experts/Personnel

Country	Name of Network	Type of Network
Arab Countries	The Network of Arab Scientists and Technologists Abroad (ASTA)	Intell/Scien Diaspora Network
Argentina	Programa para la Vinculacion con Cientificos y Tecnicos Argentinos en el Exterior (Program for the Linkage of Argentine Scientists and Technologists Abroad) (PROCITEXT)	Developing Intell/Scien Diaspora Network
Assam*	Transfer of Knowledge and Technology to Assam	TOKTEN Programme
China	Chinese Scholars Abroad (CHISA) Society of Chinese Bioscientists in America Chinese American Engineers and Scientists Association of Southern California (CESASC)	Student/Scholarly Network Local Association of expatriates Local Association of expatriates
Colombia	The Colombian Network of Researchers and Engineers Abroad (Red Caldas)	Intell/Scien Diaspora Network
El Salvador	Conectandonos al Futuro de El Salvador (Connecting to El Salvodor's Future)	Developing Intell/Scien Diaspora Network
France	Frognet	Student/Scholarly Network
India	Transfer of Knowledge Through Expatriate Nationals (TOKTEN) Silicon Valley Indian professionals Association (SIPA) Worldwide Indian Network The International Association of Scientists and Engineers and Technologists of Bharatiya Origin Interface for Non Resident Indian Scientists and Technologists Programme (INRIST)	Transfer of knowledge and technology Local Association of Expatriates Intell/Scien Diaspora Network Developing Intell/Scien Diaspora Network Developing Intell/Scien Diaspora Networks
Iran	The Iranian Scholars Scientific Information Network	Intell/Scien Diaspora Network
Ireland	The Irish Research Scientists' Association (IRSA)	Intell/Scien Diaspora Network
Japan	Japanese Associate Network (JANET)	Student/Scholarly Network

Contd.

Country	Name of Network	Type of Network
Kenya	Association of Kenyans Abroad (AKA)	Developing Intell/Scien Diaspora Network
Korea	Korean Scientists Engineers Association of Sacramento Valley The Global Korean Network	Local Association of expatriates Intell/Scien Diaspora Network
Latin America	Association Lattino-americaine de Scientifiques (Latin American Association of Scientists) (ALAS)	Intell/Scien Diaspora Network
Lebanon	TOKTEN for Lebanon	TOKTEN Programme
Morocco	Moroccan Association of Researchers and Scholars Abroad (MARS)	Student/Scholarly Network
Nigeria	Association of Nigerians Abroad (A.N.A)	Intell/Scien Diaspora Network
Norway	Association of Norwegian Students	Student/Scholarly Network
Pakistan	Return of Qualified Expatriate Nationals to Pakistan	TOKTEN Programme
Palestine	Programme of Assistance to the Palestine People	TOKTEN Programme
Peru	Red Cientifica Peruana (Peruvian Scientific Network)	Developing Intell/Scien Diaspora Network
Philippines	Brain Gain Network (BGN)	Intell/Scien Diaspora Network
Poland	The Polish Scientists Abroad	Intell/Scien Diaspora Network
Romania	The Forum for Science and Reform (FORS)	Developing Intell/Scien Diaspora Network
South Africa	The South African Netowkr of Skills Abroad (SANSA)	Intell/Scien Diaspora Network
Thailand	The Reverse Brain Drain Project (RBD) Association of Thai Professionals in America and Canada (ATPAC) The Association of Thai Professionals in Europe (ATPER) The Association of Thai Professionals in Japan (ATPIJ)	Developing Intell/Scien Diaspora Network Intell/Scien Diaspora Network Intell/Scien Diaspora Network Intell/Scien Diaspora Network
Tunisia	The Tunisian Scientific Consortium (TSC)	Intell/Scien Diaspora Network
Uruguay	Red Academica Uruguaya (Uruguayan Academic Network)	Developing Intell/Scien Diaspora Network
Venezuela	In Contact with Venezuela E1 Programa Talento Venezolano en el Extrior (Program of Venezuelan Talents Abroad) (TALVEN)	Developing Intell/Scien Diaspora Network

*Should be "India"

Source : Jean-Baptiste Meyer, 1999, http://www.unesco.org/most/meyer.html [Meyer, Jean Baptiste; 1999]

The experience of different countries with TOKTEN is presented below:

3.2. TOKTEN in Turkey

Turkey was the first country where TOKTEN was introduced by the UNDP. Initiated in 1976 as Re-Transfer of Technology to Turkey (RTTT), the project was extended and rechristened as TOKTEN after a year on confirmation that the specialists indeed had welcomed the opportunity of offering some of their experiences to their own country through short assignments.

During Phase 1 (1976-1984), the applied sciences and engineering constituted over 70% of assignments. A high percentage of consultants were from the academic sector. In Phase II (1985-87), the share of public sector consultancy increased, particularly in the less-developed regions. Importance was accorded to integrate private sector and their larger participation in seminars. Phase III (1988-90) and Phase IV (1991-93) continued to compliment the nation's technical capacity and supported the linkages with sources of foreign technologies and expatriate communities. With the initiation of Phase V (1994-2001), foreign specialists were also assigned short-term consultancies through UNISTAR, further enriched by visits arranged under other bilateral S&T Programmes.

The TOKTEN/UNISTAR activities have mainly been academic, research or industry oriented in the field of basic and applied sciences, engineering, medical sciences, environmental sciences and social and political sciences in the form of short and multiple visits comprising: group training, on-the-job training, consultancy, curricula development for academic institutions, assistance to research activities, advice in specific fields besides being resource persons in seminars and workshops (www.un.org.tr/undp/tokten.htm). The focus of advise were on promotion of new technologies, simulation of new methods of production, organization of restructuring efforts and filling of gap with the developing countries in the areas of management and technology.

The duration of visit varied from one to twelve weeks. Most visited more than one host organization and included revisits in cases of exceptional merit. Eighty five per cent of experts came from USA and Canada. The development of the 'roster of experts' was expanded by requesting each consultant to suggest five to six expatriates in their area.

The project, since its inception, was funded by UNDP together with cost sharing by the Turkish Government. The Scientific and Technical Research Council of Turkey (TUBITAK) was the Government executing agency on behalf of the Turkish Government. The project was run by a Working Committee, composed of representatives from, UNDP, TUBITAK and the State Planning Organization (SPO). At the policy level, the TOKTEN was closely linked to Turkey's five-year plan.

3.3. TOKTEN in China

China started taking interest in TOKTEN Programme in 1980. The pace of progress was slow during the initial 5-6 year period. But, looking at the advantage it had offered, China started inviting more and more of its expatriate nationals to the country and from a meager thirty consultants in the initial five years, their number swell to 130 in 1987. And, by the end of 1997, about 2000 consultants had visited China (www.ecdc.net.cn/roster/roster.asp).

The open door policies of the Government and the inclination towards modernization of the country gave a big boost to the successful adoption of TOKTEN in China. Most consultants of Chinese origin had the inherent advantages in personal communications and capacity building programmes because of the good command on the Chinese language, and familiarity with Chinese customs and traditions. The follow-up of a visit upon completion of an assignment too became very effective due to exchange of technical materials and visits of Chinese personnel for advanced studies abroad.

The TOKTEN in China is implemented by the Government, with established guidelines and management practices. Beginning with academic exchanges, the services expanded to organization of lectures, training workshops,

seminars and consultancies. The clients serviced were colleges, universities, research institutions and state-owned enterprises and collective and rural enterprises. Further, the service locations spread from coastal areas and big cities to remote areas. The consultant services covered a wide range of fields such as microelectronics, biological engineering, marine science, material sciences, natural resources, water resources management, agriculture, industry, finance, trade, economy, transportation, public facilities, education, health and law. Most of the consultants were from America, Canada and a few from other countries like Great Britain, France, Germany, Australia, Japan and Singapore

Simultaneously, a new programme called Senior Technical Advisor Recruitment (STAR) was introduced in China in 1985 to encourage and support Corporations with short-term service of retired senior scientists, engineers and technicians from the developed countries. The success of TOKTEN in China is attributed to its combination with the STAR experts who played a catalytic role in linking Chinese institutions with advanced but locally appropriate knowledge and skill.

By the end of 1999, a total of 3000 experts, mostly from the developed countries in Europe, North America and Japan had visited China to provide consultancy services in the areas of education, design, and research together with their Chinese counterparts. In recent years, the number of advisors from Eastern Europe, CIS Countries, South-east Asia and other developing countries are also on the rise.

China has set up established a full-fledged office called the State Administration of Foreign Experts Affairs (SAFEA) to initiate and implement the services of Chinese experts abroad. China has the provision of dual citizenship and dual employment norm for smooth use of their expatriates. Further, the China Association for International Exchange of Personnel (CAIEP) views in totality issues relating to the introduction of foreign intellectual resources into Chinese national programmes and even arranges partners through annual international fairs placing all the requirements of local Chinese enterprises.

3.4. TOKTEN in Vietnam

The TOKTEN was initiated in Vietnam in 1989. Under the first TOKTEN programme, a roster of 194 potential expatriate consultants was developed and sixty requests for providing consultancy services were received and 20 TOKTEN consultancies were arranged between 1990 and 1992 in the area of science and technology (http://www.undp.org.vn).

Based on the recommendations of the first TOKTEN programme, the "Umbrella Programme for Expert Services" was established in August 1995 with the object of strengthening the capacity of non-state organizations to plan, manage and deliver services that contributed to the development of the market economy and also, to recruit voluntary consultants who could provide specific advisory and training services to reinforce the country's effort to foster non-state business activities. The main activities under this project included 21 short-term business-training courses (mini MBAs) to nearly 700 participants, and "business clinics" for providing advice on management. By the end of June 1998, 51 volunteers had been recruited under this project, including 20 TOKTEN consultants from the USA, Canada, Australia and Switzerland.

The new initiative for TOKTEN Roster Development Programme in Vietnam aimed to ensure a need-based approach in utilizing TOKTEN volunteers and mainstreaming of TOKTEN into regular project development activities. This approach required the development of a TOKTEN database/roster that maximized the potential of TOKTEN.

The Government of Vietnam has appointed a Committee for Overseas Vietnamese, the national counterpart for the Vietnam TOKTEN Programme. The TOKTEN Selection Committee has been established to guide global TOKTEN procedures and relevant selection criteria. It is similar to the High Powered Committee in our case. The committee consisted of representatives from relevant ministries, agencies, and UNDP, headed by the Vice-Chairman of the Committee for Overseas Vietnamese.

The TOKTEN Programme in Vietnam follows a standard selection procedure approved by the TOKTEN Steering Committee. TOKTEN assignments are implemented through constant review of need and supply. Domestic institutions determine which skills are needed and the TOKTEN Programme identifies the most relevant TOKTEN consultants to suit these needs.

3.5. TOKTEN in Pakistan

The TOKTEN was adopted in Pakistan in 1980 with UNDP funds. The expatriate Pakistani consultants provide their expert advice in a wide range of subjects from Aerospace, Atmospheric chemistry to Geophysics and from Food and Human anatomy to Management and Economics (www.tokten.org.pk).

The TOKTEN-Pakistan got implemented in four phases during 1980 to 2000 at a total expenditure of US$3,368,053. Subsequently the focus of TOKTEN for the period 2001-2003 shifted to governance, gender and sustainable livelihood, information technology and environment with a budget of US$600,000. Since its implementation, 776 consultancies were arranged till December 1999 [Cheema, Muhammad Ashraf; 2000]. Maximum consultants came from the USA followed by Canada, U.K., Germany, Australia and other countries.

The Project has been periodically evaluated by UNDP. One of the evaluations was by an ex-TOKTEN Consultant, for the period 1991-1994.

3.6. TOKTEN in Egypt

In Egypt, the Academy of Scientific Research and Technology (ASRT) is the National Coordinator of the TOKTEN programme, serviced by a broad-based Working Committee. It provided policy orientation to the sectors that impacted national economy, namely, industry, health and agriculture. Egypt particularly encouraged women expatriates. It maintains a 'Catalogue of Supply' for matching the demand [UNDP, 1988].

Egypt heavily publicized its TOKTEN activities. Some of the methods of publicity were mass media, articles in local newspapers explaining the

concept and purpose of TOKTEN, interviews with the consultants on mission and host institutions on TV, news about the persons involved and coverage of consultancy activities and result of their works, presentations in foreign networks of radio and TV. The effect of such a wide publicity was that the demand for consultants far exceeded their availability. Up to 1987, a total of 187 consultancy missions from nine developed countries had served 80 national institutions in public and private sectors. The level of performance and the range of services achieved are attributed to the flexibility of TOKTEN.

3.7. TOKTEN in Yugoslavia

The main idea behind 'Alleviating Brain Drain in Bosnia, Croatia and Yugoslavia' by *Education Forum*, a Serbian non- governmental organization, was to treat brain drain as an opportunity for positive economic change and stabilization of South-East Europe and a catalyst for Yugoslavia's successful integration into the European and global communities.

In the first phase of this project in Yugoslavia (August-December 2001), a bilingual English/Serbian *Brain Drain website,* with a publicly accessible web-based database of individuals and institutions in nation and abroad, was developed. During the first seven weeks following the launch of the brain drain website, some 240 people had registered on the site. The members of the Brain Drain Database represented professionals living in Africa, Asia, Australia, Europe (including Yugoslavia), North America and New Zealand. These people included professionals in the field of arts, business and finance, law, medicine, science and technology.

In the second phase, it is planned to set up services to enhance two-way communication chat, Web-mail and Brain Forum to promote exchange between individuals and co-operating institutions in order to identify activities such as joint research projects, visiting positions and post-doctoral work.

This project will be extended to Croatia and Bosnia and Herzegovina in its pilot phase, and if successful as a mechanism could be promoted on a larger scale in South- East Europe and the Mediterranean.

3.8. TOKTEN in Mali

The Transfer of Knowledge through Expatriate Nationals programme at the newly established University of Mali (TOKTEN-TALMALI) fulfilled the urgent need for qualified teaching and research personnel in a number of key areas by inducting Malian academics, living abroad, into their home country on short-term contracts.

Twelve missions by visiting expatriate professors to the University of Mali were organized in the academic year 2000-2001 as a part of this joint Government of Mali, UNESCO and UNDP project. The visiting professors, living in Africa, Europe and North America, represented specialists in a wide range of fields including engineering, international law, mathematics, marketing, tourism, computer science and economics. The linguistic and cultural backing of the participants of the TOKTEN-TALMALI programme greatly facilitated the smooth transfer of knowledge and skills.

3.9.TOKTEN in Iran

Iran initiated TOKTEN programme in 1991, which lasted for six years in two phases. During the period, 280 Iranian consultants residing abroad were fielded benefiting over 40 universities and research institutions. The first phase was financed by UNDP and executed by UNOPS. With its success, the second phase was executed entirely at the cost of the Iranian Ministry of Culture and Higher Education. Maximum consultants, up to 85%, were from USA and the rest from the European countries in the fields of Agriculture, Engineering, Medical, Social sciences and Fine arts.

Another ongoing TOKTEN project was under the Ministry of Agriculture. Thirty-five consultants were fielded in specialized areas of agriculture. Several organisations including the State Organization for Administrative and Employment Affairs wish to launch a TOKTEN programme covering all the ministries and organizations in Iran and fully funded by the Government. The programme succeeded in establishing network of Iranians from within the country with the high technology experts residing abroad.

3.10. TOKTEN in Palestine

The TOKTEN programme in Palestine was initially funded by the Government of Norway in 1994, France in 1995 and Japan in 1996. It helped in capacity building, both skill and institutional development. The TOKTEN—Palestine programme chose to first identify and then field a team of experts in its developmental endeavour. Six Palestinian experts from required disciplines in strategic planning, economics, infrastructure provided their expert advice in the establishment of Palestinian National Development Planning Unit, which is now responsible for the preparation of five-year development plans for the country. A team of nine civil aviation and cargo experts helped in the establishment and successful operation of the Gaza International Airport in 1997.

Within the TOKTEN Palestinian Programme, the number of women senior experts has steadily risen. As of February 1995, over 160 expatriate Palestinians had visited their homeland under the TOKTEN Palestinian Programme and had assisted more that thirty-six different Palestinian institutions (www.papp.undp.org/governance/projects/html/accomplish.html)

The programme served a wide range of fields like Agriculture, Telecommunication, Engineering, Public health, Industry, Strategic planning, Human rights, Remote sensing, Economics, Modern arts, Sports, International affairs, Culture, Law and Legislation. Maximum expatriate consultants were from Jordan and USA followed by from other countries like France, Canada, Germany, UK, Saudi Arabia, and UAE etc.

A novelty of TOKTEN—Palestine programme was they have a web-page www.palesta.net supported by UNDP since 1998. It is a database of expatriate Palestinian professionals in science, engineering and other fields and has facilities for secured discussion among the participants.

UNDP Headquarters evaluated the programme in 1997 and by UNV Headquarters in 1998. Besides, the Government of Japan met the experts on

the International Volunteers Day in December each year to discuss their assignments in general.

3.11. TOKTEN in Cambodia

The TOKTEN programme in Cambodia was operated in three phases. The first phase was for training of all Cambodians with budget of US$280,000 during 1992-1994. The duration of assignment ranged from one to three months. The second phase (1994-96) had sectoral/thematic coverage related to all the fields like science, technology, education, commerce, industry, administration, management, social affairs, cultural affairs, foreign affairs, tourism etc., with a budget of US$902,000. The project was extended up to 1999 with additional budget of US$60,000. The majority of TOKTEN consultants were from France and USA followed by Canada, Australia, New Zealand, UK etc. The success of the programme is related to good cooperation of the Government and the UNOPS.

3.12.TOKTEN in Nepal

The first TOKTEN programme in Nepal was started in 1991 with a budget of US$298,498. A successor programme operationalized in mid 1995 with a budget of US$147,608 aimed at strengthening the technical capability in key sectors and institutions. The third phase of the programme begun in 1997 with a budget of US$108,000 sought to improve the capacity of Government agencies, academic/research institutions and NGOs for sustainable human resource development. About 31 expatriate Nepalese have been fielded in the areas of Animal sciences and genetics, Occupational medicine, Biotechnology, Computer science, Energy, Environment Education, Health manpower planning, Finance, Marketing etc. As with many of the countries, most of the consultants came from USA and Canada.

3.13. TOKTEN in Poland

Poland took advantage of the TOKTEN Programme during 1991-1999. The focus at first was on human resource development, environment, IT and infrastructure. Later, the United Nations Volunteers (UNV) scheme was added and the scope encompassed civil society institutions like social welfare institutions, city councils. The project fielded a total of 126 TOKTEN consultants during 1991-1999. The consultants came from U.S.A., Canada, U.K., France, Germany, Australia, Belgium and other European countries. The success of TOKTEN in Poland is attributed to cost sharing with the recipient institutions and participative management with the partners.

3.14. TOKTEN in Liberia

The TOKTEN programme was started in Liberia in 1995 with the objective to build human and institutional capacities of Liberia. During the four years of its implementation, seventeen experts were fielded to benefit health, education, communication, planning, mining and banking sectors. Lack of basic facilities and equipments besides poor transportation affected the programme. The programme helped more than 50% of the consultants to return to their homeland at high positions helping in the socio-economic development of the country. In view of the prevailing situation in the country, some of the consultants brought research materials and donated these to their institutions.

3.15.TOKTEN in Other countries

The TOKTEN Programme in the Democratic Peoples Republic of Korea, was initiated in 1985 and 400 Korean experts, residing mostly in Japan, have provided technical services in the areas of agriculture, fisheries, transportation, science, education and public health. Israel has introduced a novel TOKTEN-like "National Incubators Programme" wherein fifty per cent of entrepreneurs for specific R&D projects are composed of immigrants comprising both returning expatriates and foreigners. Ethiopia, Fiji, Greece, Guinea, Guyana, Haiti, Malawi, Morocco, Philippines, Syria, Thailand, Tonga

and Uganda faced basic difficulty in identifying the expatriates and developing the roster of experts.

3.16. Lessons to learn for India

It is seen from the above experiences of different countries as to how the expatriate resources are utilized by different countries in accelerating their national S&T capabilities.

The Chinese model of utilizing the creative potential of their people settled abroad by the GOI is worth considering for India. The Indian Government, Indian Industrial Associations, Associations and Professional bodies of Indians scientists, technologists, medical practitioners etc. abroad should be pursued to patronize a New TOKTEN scheme for India. Please refer to Appendix 10 for the valued suggestions of P V Indiresan on the appropriate scheme to be formulated for removing the lacunae in the erstwhile TOKTEN—India and on the integrated approach for establishing linkages between national organisations and NRIs as well as industrial associations in other countries.

Keeping in view the need for technology developments in India, the Israel's technology incubation scheme appears promising for replication in India. The Scientists and Technologists of Indian Origin (STIO) may be suitably inducted in to the Indian Technology Entrepreneur Parks/Software Technology Parks/Export Zones to produce novel products and boost India's industrial productivity.

Chapter 4

TOKTEN- India

4.1. TOKTEN-India: The Beginning

India has a large reservoir of S&T professionals settled in the developed countries such as the USA, Canada, the UK and Germany. It was estimated that the number of professionals of Indian origin in the USA, Canada, the UK, Western Europe and Australia was 1,61,000 (1981 data). 1981 data is chosen, as it is about the middle of the two decades of the project life. Assuming that even one out of fifty of these expatriates has the expertise worthy of tapping, a brain bank of 3000 highly qualified and experienced professionals was available at that time. The present number is much higher. Moreover, a developing country like India, with its vast array of research establishments, universities, and a range of small, medium and heavy industries, could provide an ideal platform for utilization of the TOKTEN talent.

India was the fifth country to adopt TOKTEN. Under the programme, distinguished scientists, technologists, management experts and other NRI professionals were invited to India as Consultants to transfer voluntarily their knowledge and know-how. Simultaneously, the University Grants Commission (UGC) had also launched in 1984, a similar scheme to attract young post-doctoral researchers to work in the Indian universities. Nearly 100 post-docs from different disciplines were invited under this scheme. However, no fresh invitation was sent after 1989 [Jayaraman, K S; 2004].

TOKTEN-India aimed at:

- Raising the level of S&T in India.
- Promoting the application of S&T and its commercialization.
- Enhancing the industrial productivity through advanced technological know-how.

- Improving quality of goods and services, particularly of small and medium. enterprises, thereby contributing to sustainable human development, and
- Training Indian professionals, both abroad and in India, in advanced techniques [GOI, 1989].

The initial formative period of TOKTEN-India Project, 1980-1982, was spent on propping up the support systems and procedures including compilation of database on potential TOKTEN consultants and the host organisations and its publicity. During the Phase-I, 54 distinguished scientists/engineers of Indian origin visited India to provide technical inputs in various R&D organizations and public sector enterprises in the country.

The Phase-II of the TOKTEN-India Project , starting towards the end of 1984 , extended up to the end of 1990. It aimed at bringing in specific technical inputs by transferring knowledge/technologies within the framework of the priorities determined by the national Development Plans. Priorities was given to projects, which lead to improvement of efficiency, improvements in the existing operational systems and encourage technological innovation and generation of new knowledge in frontier areas/key sectors. In this context, it was felt that the Phase-II of the project should function more on demand basis rather that on supply basis and In view of this, various R&D organizations and Public Sector Enterprises in India were contacted and many of them have, themselves, identified distinguished expatriate nationals who would be able to help them in the transfer of knowledge/know-how and in finding solution of some of their technical/scientific problems. Selection committee then obtained Biodata of the nominated experts for consideration.

The overseas experts invited under TOKTEN during the first two phases essentially visited the assigned research institutions in India to observe the research activities in their areas of specialization, meet the research personnel and render their advice on identifying the knowledge gaps, overcoming the shortcomings, advice on future direction of research, help in establishing foreign contacts for joint research work, facilitate joint ventures, help in receiving training, obtaining equipment, etc. Their visits also helped in

solving research problems faced by the Indian researcher and in organizing lectures and seminars

The years 1991 to 1994 may be seen as a movement to align the TOKTEN objectives with the national development priorities and to focus on industrial applications and newly emerging fields. In this phase, the emphasis was on technology transfer, joint work, skill development, trouble shooting, collaborative project, return visit of Indians etc.

From 1995, efforts to reform TOKTEN were initiated culminating in the incarnation of the 'Umbrella Project' with the amalgamation of the TCDC and the UNISTAR. The Umbrella Project came to an end in June 2001.

4.2. Scenario 1980-1995

From 1980 to 1995, a total of 470 visits of expert consultants were completed including 66 revisits, under the TOKTEN-India project. These consultants worked in more than 250 organizations covering the R&D system of the country, industrial sectors (both public and private) and academic institutions. Their contributions covered a wide spectrum cutting across different fields of physical, biological, medical and engineering sciences and technologies.

4.3. Contributions of the TOKTEN-India

The TOKTEN experts, during the first two decades, contributed immensely towards raising the levels of R&D institutions, public and private sector enterprises, universities and other organizations in fields ranging from agriculture, engineering and sciences to computer technology and management. A wide spectrum of disciplines such as alternative power resources, architecture, biotechnology, industrial hygiene and safety, machine and tool designing, microelectronics, polymer chemistry, remote sensing, telecommunications and management of water resources benefited significantly.

Introduction of many new technologies, processes and products can be traced to the participation of expatriate nationals under the scheme. R&D activities in many institutions benefited from new scientific tools, information and leads provided by TOKTEN experts. Visiting experts even donated precious chemicals, software etc.

4.3.1. Transfer of Knowledge/Know-how

There have been a number of instances when TOKTEN experts not only provided consultancy but also helped substantially in conduct of R&D in Indian institutions. Initiation of new projects, development of new designs and introduction of new methodologies in many cases can be attributed to expatriate nationals. Areas of Biotechnology / Genetic Engineering/Molecular Biology, Medicine and Health Care and Engineering, Computer and Physical Sciences benefited the most during this period.

As reported in the Terminal Review Report on TOKTEN, a number of technologies were realized and there were many spin-offs and other benefits from TOKTEN-India [CSIR, 1994]. These are outlined below.

4.3.1.1. Biotechnology / Genetic Engineering / Molecular Biology

- Genomic DNA cloning for production of higher-quantities of cellulose and xylanase enzymes and also genetic manipulation for storage of proteins in rice and peas.

- Development of techniques to estimate, isolate and characterize various enzymes for detoxification.

- Micro-chemical techniques as applied to studies on enzymes, including analysis of glycoproteins.

- Cloning and sequencing of genes and bio-technological aspects in formulation of specific proposals for marketable thermophil enzymes.

- Detection of a variety of antigens and antibodies on blood and other biological fluids.

- Membrane biochemistry leading to drug design in the treatment of various types of anemia.
- Cell biology using electron microscope techniques on ophthalmic tissues to prevent cataract.
- Reproduction physiology to explore the role of certain types of enzymes for developing antifertility vaccine.
- Demonstration of model systems for rapid screening of environmentally toxic chemicals.
- Gene transfer experiments in understanding cholera causing agents and vaccine production by using oligonucleotides.

4.3.1.2. Medicine and Health Care

- Advanced medical imaging techniques.
- Techniques for slow and controlled release of drugs, using ceramic capsules.
- Functioning of neuro-toxicology of metals in brain and toxicology aspects of various pesticides.
- Methods to clean up human plasma samples containing anti-malarial drugs and also computer simulation programmes to predict steady-state blood concentration of drugs.
- Immunological control of reproduction and endocrinology.
- Gastroenterology, nutritional carcinogens and prevention mechanism.
- Mechanism of action of "Amrit-Kalash".
- Bone marrow transplantation and tumor immunology.
- Lever and pancreatic cancer.
- Use of NMR techniques as applied to bio-medical sciences for detailed study of plants and animal tissues.

- Hydride technology for road transport—A fuel of great potential having environment-friendly properties.
- Development and production of low moisture castables of use in metallurgical operations for higher efficiency and output.
- Growth-inducing connective tissue prosthesis—for use in operations for tendon and ligament injury.
- Systems stabilization in thermal power stations to stabilize electrical power grids.
- Production of high-value fibre concrete composites.
- Anti–malarial drugs development technology.
- Sophisticated dye separation technology.
- Design of slot antenna arrays for high-technology applications.

The TOKTEN-India Programme delivered additional benefits in terms of development of R&D manpower, advanced technological processes for sustainable development and long-term interaction. Areas covered include Biotechnology, Micro- and Opto-electronics, Computer software, CAD/CAM systems, process control instrumentation, energy systems, environment and pollution control, drugs and pharmaceuticals as well as building of diagnostic facilities. Almost in every case there have been regular contacts for follow-up activities with the consultants and a number of joint/collaborative research products were developed.

4.5. Collaborative Projects

As an outcome of interactions of consultants with the host and user organisations in India, a number of collaborative projects emerged. Some of these are given below.

- Dr J R Tata, FRS, National Institute of Medical Research, London, UK finalized the following three collaborative research Projects:

(i) To Investigate the Regulation of Biosynthesis of Vitamin- binding proteins by Oestrogenic Hormones(taken up at IISc, Bangalore).

(ii) Use of Primary Cultures of Mammalian Uterine Cells to Investigate the Progestin Like and Anti-progestin Activities of Both Synthetic and Naturally Occurring Products (at CDRI, Lucknow).

(iii) To Investigate Centchroman and Other Anti-Oestrogenic Compounds (developed in CDRI) by using techniques of cell culture and recombinant DNA (at CDRI, Lucknow).

- Dr A Therwath, University of Paris, Paris, France formulated joint collaborative project on cloning and characterization of strong promoters with NCL, Pune

- Dr M K Ticku, University of Texas Health Science Centre, San Antonio, Texas, USA concluded a protocol for Neuroliptic drugs and methodology for neuronal cell culture ion flux studies at CDRI, Lucknow and also for the binding of drugs to radio ligand binding techniques at PGI, Chandigarh.

- A collaborative work on the research techniques used in the study of immune responses to infectious agents was agreed by Dr R P Tewari, Southern Illinois University, Springfield, USA with CDRI, Lucknow.

- Dr T K Sundaram, University of Manchester, Institute of Science and Technology, Manchester, UK formulated specific joint research and development of marketable enzymes with CFB, Delhi.

- Dr N J Unakar, Oakland University, Rochester, Michigan, USA discussed protocol and provided documents to PGI, Chandigarh on latest available techniques for the preparation of biological specimen for scanning electron microscope, techniques developed for ultrastructural enzyme cytochemistry.

- Dr P C Srivastava, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA developed a collaborative project at CDRI, Lucknow on a scheme of the nucleoside synthesis.

- Dr J K Reddy, North Western University Medical School, Chicago, USA and the AIIMS, New Delhi jointly developed collaborative research projects in the localization of enzymes in cultured central nervous system tumors.

- Dr P S Rao, LIJ Medical Centre, New Hyde Park, NY, USA developed joint projects with CFB, Delhi and Nizam's Institute of Medical Science, Hyderabad for development of immunoassays with aspergillosis fumigatus for testing patients of ABPA and direct effect of oxygen-free radicals on tumor cells

- The following collaborative research projects have been developed between Dr V Ramakrishnan, South Dakota School of Mines and Technology, Rapid City, SD, USA with SERC, Madras:

  i. Development of high volume fibre composites
  ii. Development of analytical modelling techniques

iii. Studies on thermal shock and thermal fatigue of fibre-reinforced concrete

- Dr Punit Boolchand, Department of Electrical and Computer Engineering, Cincinnati established scientific collaboration with NPL, New Delhi in the general area of Basic Science and Application of High Temperature Superconductivity.

- Dr A P Balachandran, Professor of Physics at Syracuse University, USA initiated joint research project with the Institute of Mathematical Sciences, Madras on "Molecules as Quantum Shapes and how they violate P and T". At TIFR, he initiated collaborative research projects on "Edge States in Gauge Theories" and "Topology in Physics".

  As a follow-up of the programme, joint projects are currently being pursued between LRDE and Syracuse University. It is proposed to have joint research programmes on `analysis of arbitrary shaped slots in waveguides' and `adaptive signal processing'.

- Dr O P Malik, Professor of Electrical Engineering, Associate Dean of Common Curriculum, Faculty of Engineering, University of Calgary, Canada proposed to establish joint programme on "Adaptive Control in Power Systems". He studied the possibility of applying adaptive relaying techniques at CPRI, Bangalore.

The programme has immensely helped in developing human resources of the country by way of training of young Indian researchers/scientists at the consultant's laboratories/institutes as part of collaborative projects. This added to about 30,000 man-days training [CSIR, 1994]. Assuming a modest figure of 100 dollars per day as the average expenditure for such training, the estimated total financial involvement resulting from this single item would be around 3 million dollars.

The TOKTEN implementation Centre of CSIR (INRIST Centre) has built up a fairly large database and has brought out hard copies of "Directory of non-resident Indian Scientists and Technologies" in six volumes. Directory of Indian Industrial Organizations along with their brief product range/ activities was also complied. It could facilitate deployment of TOKTEN Consultants in an effective manner. Many financial institutions like Commercial Banks, Bajaj Capital, Indian Investment Centre etc. took benefits of the TOKTEN project and utilized NRI Directories to mobilize investments from NRI community in various financial schemes.

INRIST Centre of CSIR supported by UNDP organized an International Workshop in January 1992, to give wide publicity and spread awareness about the programme to various industrial organizations as well as R&D institutions in the country. TOKTEN thus got introduced to the industrial sector.

4.6. Database of non-resident Indians

During its implementation period, TOKTEN-India programme could establish a valuable database of about 20, 000 NRIs. Information of 3,000 NRIs have been brought out, as Directories of Non-resident Scientists and Technologists, in two volumes.

Volume I has brief bio-data of about 1500 experts covering their present status, specialization, academic qualifications, immediate past experience, number of publications, patents, etc. under six broad subjects, namely, Biology, Chemistry, Engineering, Medical, Physical and Social sciences. Volume II provides names and addresses of about 1,500 experts.

The information have been obtained/collected form various sources such as Indian Missions and some Associations abroad, Indian organizations, TOKTEN Consultants, UNDP and NRIs. The Directory includes Nobel Laureates, Fellows of Royal Society and Distinguished Academics.

4.7. Overall Gain of TOKTEN-India

As may be seen below, during this period, the TOKTEN chiefly aided basic research.

- 81 % of all consultancies were in Basic research and 19 % had industrial applications.
- 79 % experts were hosted by Government or Public Institutions & 21 % by Industrial Units.
- The subjects which received boost were Physics, Biochemistry, Electronics / Electrical engineering and Computer science.

- The Lobell evaluation mission, in May 1994, shifted focus from basic research to consultancies with industrial applications.

The following statistics convey the overall outcome of TOKTEN-India during the period 1981 to 2001[CSIR, 2000].

- Over 550 Expatriate Nationals served their homeland in their chosen fields of specialties.
- Over 250 Organizations benefited
- 30,000 Man-days of overseas training was delivered
- 50,000 Man-days of training was achieved in India
- Eighteen thematic workshops and seminars were held

As elaborated earlier in this chapter, with specific examples, benefits of TOKTEN-India have been widely felt and appreciated as under:

- Development of new products/processes
- Transfer of knowledge/technology
- Demonstration of new laboratory procedures/techniques
- Solving of specific problems in R&D projects
- Training of researchers in new techniques and technologies
- Transfer of laboratory procedures and protocols
- Transfer of knowledge and information through workshops, seminars, lectures and discussions.

4.8. Assessment of TOKTEN through Questionnaire Survey

India started the TOKTEN as an independent project. TCDC and UNISTAR programmes were also concurrently operating, though separately. The Umbrella Project weaved the three together in order to take advantage of each other's efforts and create a synergy. However, TOKTEN (besides UNISTAR) did simultaneously function as an extended arm of Umbrella Project by fielding the consultants to selected host/user organizations as per their felt needs.

A Questionnaire Survey of NRIs, who visited India under the TOKTEN independent stream of the Umbrella Project, was carried out to examine the basic premises of TOKTEN concept and also some of the issues related to its implementation and finally the impact. The specific questions raised are given in Appendix 1.

The first set of Questionnaire was sent to 48 NRIs invited under the independent stream (other than synergy stream) during 1996-2001. Of these, one has expired and four mails have returned, and remain untraced. The responses were received from 23 NRIs from different countries included USA, UK, France, Australia and Canada. A list of these respondents is given in Appendix 2. The responses are summarized below. The same view if held by more than one expert is reflected only once.

A suitably modified questionnaire (Appendix 3) was also sent to the Indian recipients of knowledge transfer to elicit their experience on the concepts, implementation and impact. The list of those contacted is furnished in Appendix 4. This list includes those who were associated with TOKTEN at policy level and were informally interviewed. The significant messages, collected from 45 individuals associated with the hosts/users and TOKTEN Committees, are suitably incorporated below. Similar answers when received are not repeated in the write up.

4.8.1. Effect of Patriotic, Cultural & Linguistic Bonds of NRIs

Historical, cultural and linguistic proximity has been a great TOKTEN driver. Cultural sensitivity basically facilitates quicker adaptation to local conditions, saving time and effort in transfer of knowledge. Ball and Rong have highlighted the major problems arising out of cultural differences between China and the West [Ball, D F; 1993]. The Chinese have a totally different work practices and management responsibilities. The authors feel that in China, its bureaucracy is a problem and not the language. Zitt *et al* have furnished examples of impact of cultural sensitivity over geographical proximity. They found a particular strong bond between Japan and the USA [Zitt, Michel; 2000]. Okuba and Zitt too have found mutual preference between pairs of European countries, viz., Finland-

Sweden, Denmark-Sweden, Netherlands-Belgium, Portugal-UK, Italy-Spain, Denmark-Finland. They observed that when spatial and cultural proximity overlap, a particular strong bond is recorded [Okuba, Yoshiko; 2004]. Studies on cultural binding are also furnished under Section 7.2.

One of the objectives of the Questionnaire was to find out if the cultural similarity of NRIs is of any special advantage. The desire to help fellow Indians is very strong. This is not only stated in the responses received from NRIs but also can be seen in the benefits from the visit of TOKTEN experts to India. The NRIs were swiftly able to adjust to the working conditions in India viz. tools, technologies, travel, stay. As per the responses received from both the NRIs and the recipients, cultural homogeneity did facilitate easier communication and understanding between the experts and the Indian counterparts. An illustrative response from an expert is "Because of the large number of sites (8) that I had to visit, my stay at each site was very short (2-3 days). However because of my Indian background and because of the free flowing discussions and exchange of thoughts it was indeed quite profitable".

According to one host institution, "Since the NRIs had earlier worked in India; they have the necessary understanding of the prevailing conditions in industry and research institutions. Due to cultural affinity, the interactions with them were smooth and candid. Whenever difficulties to carry out their suggestions were expressed, they had the appreciation of the underlying problems".

Secondly, the TOKTEN consultancy was conceived to be offered almost free of cost by the expatriates. This was a significant sacrifice on the part of the NRIs. When a question was asked in the Survey that, if the consultant was to provide the consultancy, not under the TOKTEN-India programme, how much consultancy fee would have been charged at that time? The different responses ranged from no charge (Dr. Anu Puri working on AIDS) to an average fee of US $ 500 per day plus travel expenses.

According to Dr. Chugh "The bigger gain is that host organizations can better relate their issues to NRI consultant because of language advantage. We have a better understanding of the cultural and geographic issues"

Besides, the cultural relationship, expatriates' love for their motherland, resulted in certain 'out of the way' contribution by the visiting expatriate nationals. Here are some examples:

- Dr. Naresh Chand, AT&T Bell Laboratories, Murray Hill, NJ, USA loaned to TIFR 5-bonded 0.98 Urn lasers for characterization. He also offered them an important technique for fabricating BH Lasers using facilities already established at TIFR.

  At SAMEER, Mumbai, Dr Chand had discussions about launching a programme on `Crystal growth and Lasers fabrication'. He further provided laser chips to them for laser characterization.

- Dr. Awtar Krishan Ganju, University of Miami Hospital & Clinics, USA had discussions with research faculty regarding screening of natural products for cytotoxic and cytostati activity and he offered to analyze samples and transfer the results by internet. Dr. Ganju also offered to send the indicator cell lines (not available in India) from USA and promised to arrange for sending some reagents and procedures for rapid monitoring of cellular drug resistance.

- Dr B N Datta, Professor in the Department of Mathematical Sciences, North Illinois University, USA, provided details about the latest developments in the area of super computing at the Indian Institute of Science (IISc), Bangalore and helped them to obtain the associated software packages. He also described the parallel algorithms for control problems and practical applications and suggested the `future directions' for research in that area.

- Dr Pankaj K Das, Professor, Electrical Computer and Systems Engineering Department, Rensselaer Polytechnic Institute, Troy, New York, USA, visited a number of organisations (IIT, Delhi, CGCRI, Kolkata, NIO, Goa) to develop a new technology, which is very critical and has a vital role in communications and radar systems. At NIO,

scientists were interested in the instruments involved in real time spectrometers, which are highly useful equipment in oceanography. The expert provided details about a different spectrometer known as AOTF (Acousto-Optic Tunable Filter) to perform oceanographic experiments.

- Dr J R Tata, FRS, National Institute of Medical Research, London, UK has been making significant contributions under the TOKTEN-India Project as a member of the "Overseas Advisory Committee" of the Department of Biotechnology, Government of India.

- Dr. S S Iyer, of IBM Thomas J Watson Research Centre, New York, USA made available software used by IBM, with necessary modification to the Solid State Physics Laboratory (SSPL), Delhi.

The cultural affinity of TOKTEN consultants as found unanimously in the present survey of NRIs is corroborated by an earlier survey of NRIs conducted by the TOKTEN-India Project Team in the International Science & Technology Affairs Directorate (ISTAD), CSIR in August 1999 wherein the emphasis was on the question of sustenance of TOKTEN [Bhandari, R K; 2001]. It brings out the strong desire of NRIs to help their country of origin.

- Many NRIs would like to provide the benefit of their rich experience to Indian industry, university and R&D institutions, making TOKTEN programme effective.

- A number of NRIs are interested in promoting links as well as setting up industries in India either jointly or independently. The joint venture may serve as a central infrastructure for installation and use of database.

- In response to a question on creating a corpus fund with contributions from the NRI community and other stakeholders in order to sustain the TOKTEN, most (80%) of the experts agreed to such a creation. The practicability of setting up a fund through contributions from the NRI

community and other sources to finance future TOKTEN activities, as reported by P V Indiresan is given in Appendix 10. The recommendations of S&T Expert Group set up by the GOI includes establishment of an autonomous "Society for Technical Cooperation through Global Indians" with corpus fund of Rs. 20 crores, sponsoring 2000 visits annually, facilitating introduction of 100 technologies into India

An NRI from Japan felt strongly for India. "I am sending my CV as an attachment file to you. If there is anything I can do to my country, you can count on me. I want to see a day when I can call a Japanese guy to work in my lab in Japan with the same fellowship".

The NRI consultants visited their host organizations and interacted with the scientists even during their holiday trips, sabbatical leave, or even when they came to India on their personal visits. Bireswar Chakrabarti, Senior Scientist, Eye Research Institute, Harvard Medical School, Boston, USA, specialized in the field of complex carbohydrates, visited the CSIR Centre for Biochemicals (CFB), New Delhi, twice under the TOKTEN Project and three times on his own and helped the Centre to isolate sodium hyaluronate (used during implantation of intraocular lenses following cataract surgery) from Rooster's Coombs. The characteristics of the isolated product were tested in the laboratory of the TOKTEN consultant at Boston. M/s Cadilla Laboratories, Mumbai was importing the product from Italy in the finished form and market the same in India. This company after studying the product characteristics and its tolerance in animal experiments decided to take up the technology from the CFB.

Evidences of empathy can be seen in the actions of NRIs. The visiting consultants provided equipments and materials such as rare chemicals, tools for performing experiments, computer software, reprints, manuals, books, instruments etc., not readily available in India, to the host organizations. Few specific instances, during 1981 to 1993, are given in Table 3.

Table 3: Gifts from NRI Consultants

i.	Dr P K Bajpai University of Dayton Dayton, OH,USA	Six Ceramic capacitors
ii.	DR Ram P Tiwari Southern Illinois University Springfield, USA	Two Kidney dialysis machine along with other equipments, one spectrometer, several reagents and molecular antibodies donated to K G Medical College, Lucknow and Kothari Centre of Gastroenterology, Kolkata
iii.	Dr Sukumar Bandopadhyay Professor of Mining Engineering, Univeristy of Alaska, Fairbanks, USA	a) Several faculty members of BHU, Varanasi and ISM were trained in the use of Operation Research Models in Mining Domain and complete Computer Applications in Mining b) Course materials provided c) Operations Research Models were installed at the Institute's Computer Centre
iv.	Dr Amiya K Mukherjee University of California, Davis, USA	Six papers shared which are not readily available in India (DMRL)
v.	Dr Kumar D. Mukherjee HP Kaufmann – Institute Munster, Germany	Provided Sephacryl 200 for chromatography of proteins and amino acid kit (DNP derivatives) as reference mixture for high performance liquid chromatography
vi.	Dr P A Ramachandran Washington University St. Louis, Missouri,USA	A number of computer software programmes which use the boundry element techniques for the solution of Chemical Engineering problems provided to IIT, Delhi
vii.	Dr D Ramakrishna Purdue University West Lafeyette, USA	Made available software developed by the consultant at Purdue University for solving population balance equations to the group at IISc, Bangalore
viii.	Dr Ashok Saxena Georgia Institute of Technology, USA	Provided several reports, papers many over-head projectors slides, two software manuals and demo disks to NML, Jamshedpur. These software are used for evaluating the interplay of elevated temperature steampipes and for general purpose fracture mechanics analysis
ix.	Dr M Sengupta University of Alaska Fairbanks, USA	Computer programme diskettes in areas of Mining Engineering
x.	Dr V S Vutukuri University of New South Wales Australia	In addition to computer programme (VENWORK) on a PC, 3 programmes for auxiliary ventilation system design
xi	Dr. Som R Soni Ad. Tech Systems Research Inc. Ohio USA	Donated an Automated System for Composite Analysis (ASCA) code to NAL .

4.8.2. Brain Gain

With regard to brain gain two questions that needed examining are, (i) What is the reason for the Indians to seek knowledge from the NRIs. (ii) Was there brain gain for Indian researchers under the TOKTEN-India programme.

One of the respondents, Awtar Krishan Ganju said that the boundaries of S&T are fast expanding and India need to catch up, except for IT. Also there is lack of expertise available in India in certain fields like in advanced cytometry. The scientific and technical interactions with the NRIs are considered to be valuable for problem solving, motivation and innovation (Prof. Som Soni). It helps in future collaborative efforts. TOKTEN occupies special significance due to its concept of utilizing expatriates for transfer of knowledge. For example, Dr B N Datta, Professor in the Department of Mathematical Sciences, North Illinois University, USA, a specialist in mathematical computations, provided high-tech knowledge to Indian scientists and engineers on advanced computations and their applications. Dr. Datta had suggested the development of supercomputing for applications in India at the Indian Institute of Management (IIM), Kolkata. Dr. Deepak Bhat observed lack of access to information from commercial companies that may already be marketing the products being developed at IITs. Dr. S. Venkatesan considers NRIs to be a valuable channel for providing exposure to the technical advances in developed countries. Dr.Chugh very much felt that NRI consultant is usually better equipped with knowledge, endowed with foreign experience. He has visited India several times and each time he was able to provide some new ideas worth pursuing.

Dr. Desiraju has pointed out that TOKTEN helps to expose several young graduates to meet and interact with scientists from abroad and develop both personal and scientific contact that can be useful in their career growth.

Dr. Hemant Majumder strongly feels that updating knowledge is relatively not difficult and we may have knowledge of latest development at par with the scientists abroad. But the NRIs have developed expertise over the years, by because of work at cutting edge technology abroad. Hence, it is the superior

The choice of areas should be guided by where our capabilities are significantly developed and also in areas of national priority like drinking water, energy and health. This also requires identifying NRIs who can genuinely deliver.

CSIRs Indian Institute of Petroleum (IIP) has pioneered the technology of petroleum refining. Dr. A K Gupta, a senior scientist of IIP indicated the Prof. Rakesh Aggarwal, an acclaimed expert in petroleum refining technology with over 350 patents to his credit is a retired NRI and is now willing to assist India in this endeavour. India should explore such opportunities under TOKTEN.

The question that may arise is: why not an Indian consultant? The possible reason that the NRI felt is that the amount of exposure had by the NRIs working abroad is in many cases unique. The Indian host/user communities admit that NRIs in advanced countries are ahead because of their state of the art facilities and knowledge-sharing environment in Europe and America.

Much of the learning depends on scientific culture of the institute, competency of the personnel, infrastructure/facilities available in the Institute and interest of the recipient organization.

The TOKTEN Project Team in CSIR had carried out a survey of NRIs to elicit their views on the usefulness and sustainability of the TOKTEN programme. The responses received for two of the Questions, which are relevant to usefulness of TOKTEN are consolidated and presented in Appendix 5 along with additional discussions and comments.

4.8.3. Tacit Transfer of Knowledge

A feature of TOKTEN that draws attention is the tacit transfer of knowledge, which required physical presence of the expert for face-to-face interaction in solving problems. It underscores the experience and intuition of the expert that works on looking at the problem. It is evident that "Training" requires personal skill transfer.

A Question was therefore introduced in our Survey to know about the embodiment of knowledge in the consultant and the necessity of physical presence for offering consultancy. Two Questions that were posed were:

a) Do you think that your physical presence was necessary to render the consultancy?

b) In view of developments in communication and internet technologies, for the kind of assignment you did under the TOKTEN programme, can the travel of consultants be reduced/avoided?

The consultants emphasized that since transfer of expertise involves latest research techniques, physical presence was mandated to deliver and demonstrate expertise (Anu Puri). The physical presence also enabled formal/non formal discussions which would be limited if done through Internet. Avoiding travel would result in less interaction and there by less advantage to the host organization. The visit of experts helps the researchers to gain access to technical advances in the developed countries (Dr. Deepak Bhat). The respondents felt that, in spite of development and communication in Internet technologies, person-to-person interaction is considered a must in technology transfer activities by all the respondents. Dr. Robin Chowdhury felt that the initial travel is considered essential and follow up through Internet is recommended.
An experienced consultant in the area of high voltage-electric power grid has opined that modern communication including the Internet are of great help but on-sight visits are necessary in this field of R&D.

Prof. Chugh felt that personal discussions are the key to understanding the problem and sharing why one approach to solve it would be better than the other. Dr. Desiraju affirmed "even in this day and age of fast communications, personal face-to-face contacts can never be replaced by machines".

An Indian beneficiary Dr. Satyavali explains "sometime it is very important to understand the material itself and visit of the expert was very useful in this

regard and also the grey area which we did not know was touched upon first time in our field".

It may be said that communication via Internet is never a full replacement for physical meetings, which are essential to create trust between individual. It is only when this has been established that the Internet can facilitate genuine collaboration. Section 7.5 underscores the importance of trust in successful collaboration.

Evidences of tacit transfer of knowledge may be seen in the TOKTEN assignments. Some instances are given below.

- The antibiotics production plant of IDPL has been facing the problem of obtaining new and high-yielding microbes. For this, Dr Vedpal Singh Malik, Philip Morris Research Centre Richmond, VA, USA was contacted and he visited India thrice to assist organizations like IARI, IDPL to develop state-of-the-art technology in the area of DNA sequencing and *in vitro* mutagenesis. The consultant conducted a demonstration of the methodology of mutagenesis and selection of improved strains. He further trained the scientists so that they may develop new strains and evaluate them of their own. He also conducted a National Training Course on M-13 Cloning, DNA Sequencing and *in vitro* Mutagenesis at IARI and trained 12 researchers from 8 institutions in the state-of-the-art technology.

- The Central Power Research Institute (CPRI), Bangalore has reported that the advice of Dr P. Sarma Maruvada, Consultant, High Voltage Engineering, Canada, had been useful in overcoming many problems in the process of completing corona cage facility and validating the same and in bringing it up to international level.

- Dr D Bastia, Professor of Microbiology Duke University Medical Centre, Durham, NC, USA specialist in DNA sequencing and fusion protein, visited CFB, Delhi and conducted several sets of experiments to work on molecular biology of anti-termination of replication and also to transfer technologies of gene expression in yeast and the hybrid

technology to study protein-protein interaction and protein engineering using yeast as a system. On return, he used his skills and techniques to synthesize clone and express human EGF and clone other important genes for institutions like CSIR and DBT.

- Dr Anand Mohan Chakrabarty, Distinguished Professor, University of Illinois, Chicago, USA, gave state-of-the-art technology in microbial degradation of hydrocarbons and chlorinated compounds and interacted with a large cross-section of people from the industry in Mumbai and Baroda to develop the emerging field of 'Genetic Engineering Technology' and study the possible mechanisms of technology transfer from developed countries to India. Dr Chakrabarty being a pioneer in biotechnology could give extremely valuable guidance to the industries.

- Dr Naresh Chand, Member of Technical Staff, AT&T Bell Laboratories, Murray Hill NJ, USA , a specialist in the area of Optoelectronic Devices ,had interaction with the scientists working on Molecular Beam Epitaxy (MBE) at SSPL, Delhi, and made several suggestions to improve the quality of their layers and to gear their programme towards 'Laser fabrication'. Technical collaboration has been developed in areas of diodes and lasers both with SSPL and CEERI, Pilani. He also provided the epitaxial layers for processing the characterizing of these devices at both these organizations.

- Dr D P Agrawal. Professor in Department of Electrical and Computer, Engineering, North Carolina University USA, having specialization in Computer Engineering, visited Centre for Development of Advanced Computing (C-DAC) Bangalore, Indian Statistical Institute (ISI), Kolkata, and IIT, Delhi. At C-DAC, he worked with the Software Group which involved parallel library development. He provided useful tips on the parallel Super Computer Machine called "PARAM" developed at C-DAC. He had seminars on Comparative study of Multi-Computer Networks and Graph Theoretical analysis. At ISI, he delivered lectures on the use of computer vision to determine various characteristics of a

metropolitan area, such as roads, housing and the natural language processing. At IIT, Delhi, he delivered lectures on "Design and performance of Generalized Shuffle-Exchange Multistage Interconnection" and 'Scheduling Pipelined Communication in Distributed Memory Multiprocessors for Real-time Applications'.

- Dr Pankaj K Das, Professor, Electrical Computer and Systems Engineering Department, Rensselaer Polytechnic Institute, Troy, New York, USA, specialized in the area of Solid State Electronics and Signal Processing Devices visited a number of organizations (IIT, Delhi, CGCRI, Kolkata, NIO, Goa) to develop a new technology which is very critical and has a vital role in communications and radar systems. At IIT, Delhi, he carried out work in the area of opto-acoustic signal processing and also provided useful guidance to the group engaged in fiber and integrated optics. At CGCRI, he provided help in the area of fibre optic fabrication and measurements of parameters.

- Dr Krishna Sapru, President, Technology Innovation Products and Services, Inc, Troy, Michigan, USA under the TOKTEN programme closely worked with the Department of Physics, BHU, and Varanasi on application of hydride technology for fuelling motorcycle. Her major involvement was in the improvement of the working of hydride/hydrogen fuelling motorcycle, developed by the Department. This entailed considerable transfer of tacit knowledge. The Hydride/Hydrogen Motorcycle underwent trial runs (42 km in one charge) in the presence of the consultant.

- At Central Power Research Institute (CPRI), Bangalore a resonant converter for use in protective relay coils was designed by Dr A K S Bhat, Professor, Department of Electrical Engineering, University of Victoria, Canada. The consultant provided the component values and help in solving major problems of availability of high-frequency components like power capacitor, ferrite cores, and fast recovery diodes. Switching frequency was increased by searching for

appropriate ferrite magnate core now available in the market reducing the size, weight and cost of the converter.

- Dr M A Pai, Professor, Department of Electrical and Computer Engineering, University of Illinois, Urbana, USA provided state-of-the-art techniques on developing a mathematical model for small signal stability analysis in power systems. This critical knowledge could not have been applied unless Dr. Pai had seen the problem. His work has been successfully applied to establish system-stabilization for Raichur Thermal Power Station.

- Dr T V Somayajulu, Senior Scientist, SM Systems and Research Corporation, USA visited the Indian Satellite Centre, Bangalore and personally examined the quality of satellite data available for about 200 orbits from three tracking stations, Bangalore, Lucknow and Mauritius and furnished his valued comments.

- Dr (Ms) M A Vijaylakshmi, Director, Separation Technology Labs, University De Technology de Campiegne, France during her visit to CFB, on close observation suggested and helped the centre to cut costs of a number of chemicals through effective separation processes and also increase the purity of biochemicals.

- Dr R D Lama, Manager, Mining Technology, Kembla Coal and Coke, Wollongong Australia, a specialist in rock mechanics/environmental engineering visited the National Institute of Rock Mechanics, Kolar. His interactions and his presence led to the development of different alternatives like redesigning of pillars and use of small continuous mines. The consultant suggested that the institute should use techniques such as resistivity measurement, polarization, radio imaging, and unseen seismicity. These techniques have been extremely useful in coalmines in predicting faults, dykes and other discontinuities.

- Dr S H Chintamani, Scientist at Aerodynamics Technology, Boeing commercial Airplane Group, Seattle, Washington, USA, specialist in

aerodynamics provided assistance in developing the test programme to optimize the wing flap systems. He provided detailed methodology for the assessment of stability and control of the proposed airplane. He helped the NAL in developing an interactive programme for obtaining the details of the methods to estimate the sizes of horizontal and vertical tails for a given wing body and engine combination. He gave the design study, which proposes the use of an ejector in combination with conventional fan motor drive. He also offered personal assistance to accomplish the wind tunnel testing for guide confirmation of the airplane. He was instrumental in providing a good design for both trainer and light transport aircraft. All these could only be attributed to his close association with the work.

- At Central Mining Research Station (CMRS), Dr R D Lama, Manager, Mining Technology, Kembla Coal and Coke, Wollongong Australia, observed that prediction of gas emission at the Gas Testing Laboratory and Mineral Biotech Laboratory was not optimal. He therefore advised on using all the available methods for and then decide which method suits best.

- Dr. Tapan K Sarkar, Syracus University, New York, USA assisted several organisations in development of numerical techniques to evaluate EMI fields in relation to design of circuits and systems. At LRDE, the objective was to develop a scientific methodology for the analysis of slots in waveguides. A critical look was taken of the papers available in the published literature and a methodology was evolved for design of slot antenna array.

- Dr. S S Iyer, of IBM Thomas J Watson Research Centre, New York, USA gave a number of suggestions for fabrication improvements in the area of semiconductor devices.

- Dr. Samar Chatterjee of Dynamic Corporation, Silver Spring, USA visited some of the existing waste water treatment plants located in other parts in India under the Ganga Action Plan for undertaking

defectiveness analysis. He has made available new corrective action software to Ganga Project Directorate.

- This analysis would help in identifying the process defects, if any, in a treatment plant and taking corrective actions there on. He also helped in identification of low cost technology options in terms of both the capital and the organization and management cost for treatment of wastewater as well as hazardous wastes.

- At UDCT, Bombay, Dr. S Katti of DOW Chemicals, USA helped in accelerating the degradation test, new solvent development, modeling and simulation of acid gas removal systems. He demonstrated the flow in 'Agitated Tanks' and its extension to two phase systems.

- Dr. S K Banerjee, Institute for Rock Magnetism Newton Horace Winchill School of Earth Sciences, USA undertook paleomagnetic studies of samples using a super conducting (SQUID) rock magnetometer. He developed a project on morphology of geomagnetic field reversal and secular variation. Paleomagnetic directional studies were made to obtain relative paleo intensities of the Geomagnetic field from the transitional samples and incorporate data in to the existing mode. At the end he tried to establish simultaneous N_Plate tactonics of the collision zone from very long base interferometry studies. His studies formed the basis of "Past Climate Changes" in India using Paleomagnetism. He suggested the use of rock magnetism for solving global climate change problems.

- Dr. D Mangaraj, Battelle Memorial Institute, Ohio, USA visited the Fort Gloster Industries Ltd. and discussed various aspects and suggested improvements in the mechanism of dielectric ageing and cable failure. The consultant analysed the reasons for lack of strength of plastic wood and suggested ways and means to improve them at M/s Omega Industries – who are engaged in developing plastic wood based on scrap polymers, wood flour and fillers. At M/s Boolani Engineering Corporation, a major manufacturer of extruders, the consultant

suggested the use of Ultrasonic transducers in conjunction with modular screw and barrel in the mixing zone of the extruder to improve the mixing quality of efficiency. He also gave a detailed insight for development of polymer blends application to meet the need of engineering plastics and thermoplastic elastomers in India.

- Dr. H N Sinha, CSIRO, Australia visited the Orissa Sands Complex (OSCOM) under Indian Rare Earths Ltd. A test programme to optimize the parameters for oxidation, reduction and leaching was devised and a large number of experiments were carried out with the guidance and assistance of the consultant.

- Dr. M Jeya Chandra, visited M/s Maini Precision Products Pvt. Ltd., Bangalore. His visit has helped the organization in making a clear plan for the implementation of ISO 9000 and the sequential quality control techniques taught by the consultant has helped the organization to bring down rejection percentages.

- Dr. B S Jandhyala visited R&D Centre of IDPL, Hyderabad. The visit was planned for a diagnostic study of existing facilities, methodologies and work in the therapeutic group. Dr Jandhyala demonstrated how the existing facilities could be upgraded to match with international standard with certain changes in basic techniques. He suggested methods of improvement/changes in animal models.

- Dr. Y K S Murthy, specialized in the area of antibiotics, worked on a TOKTEN assignment at IDPL Antibiotics Plant at Rishikesh and also visited IDPL Hyderabad and Madras Units to explore up dating of their production-mix. He examined technological parameters of fermentation-based antibiotics with special reference to penicillin. Several valuable suggestions at each stage emerged and it became possible to arrive at a practical picture of material balance and process efficiency.

- Dr. Bireswar Chakrabarti of Harvard Medical School, Boston, USA conducted series of experiments with CBT, New Delhi and standardized the procedure giving the desired characteristics to the isolated product.

4.8.4. TOKTEN Consultancy for Transfer of Knowledge

The transfer of technology can take place through collaborative projects, joint ventures, licensing, consultancy etc. The transfer of technology or knowledge in the TOKTEN Project was chiefly by consultancy. Further to our enquiry on the basic premises of TOKTEN, a question was introduced to find out the special advantage of consultancy mode of transfer of knowledge or technology.

A professional Consultant is an expert who provides technical input to an activity or project, caries out feasibility study, analyses client/owner requirements and helps in successful execution of a project. However, the nature of consultancy under the TOKTEN-India programme was different. An examination of responses received indicates that the TOKTEN service may be looked upon as free 'Advisory service'.

Historically, the purpose of visit of the consultants in the first phase (1980-1984) was essentially to familiarize the experts with the ongoing projects and activities in the area of their expertise for seeking advice by the Indian organizations on future direction of research. Hence, lists of consultants were circulated to elicit the user demands. Later, this 'supply driven' strategy was changed to 'demand driven' one, with users identifying the consultants based on the requirement of consultancy. A question was therefore posed in our Questionnaire survey as to which method did the consultants think was better and why? All of the consultants who responded admitted that technology transfer is successful in demand driven approach since the users know the expert by his professional standing and the failure rate is thus reduced. It was essentially a short-term visit with average duration of two months. Broadly, the visits resulted in troubleshooting and capacity building covering both Individual (Training, Papers, Collaborative projects) and Institutional

(Infrastructure, Software, Chemicals, Technology transfer, Industrial applications, Product/Process development).

With regard to TOKTEN, the Intellectual Property Rights (IPR) is of special significance because there is possibility that the People of Indian Origin may file patent abroad (Prof. Ghanshyam Pandey). However, Dr. H S Maiti said that it was possible to overcome IPR problem under TOKTEN because of the informal nature of interaction. As per the sample Questionnaire survey, there was no IPR issue under the TOKTEN-India Project.

The short-term consultancy mode is observed to be not free from defects. The non-availability of supportive staff and equipment can be a major handicap (Prof. Amu Therwath). Secondly, unlike in project-based activity, the consultancy approach is generally taken as one-off activity requiring no follow up, which is a serious shortcoming. A limitation experienced by a consultant was the lack of sophisticated equipment for demonstration and training (Mohan D. Rao). Another freelance consultant of Canada, Dr. P. Sharma Maruvada has indicated that delay in obtaining, and some time lack of equipment slows down the transfer process within the consultancy period. Further, the consultancy may become very difficult if the expected beneficiary do not come out openly with their questions. This was experienced by Krishna Sapru who found that university students were afraid to be open and frank in the presence of their supervisor and challenging a superior was out of question in India. According to Dr. Desiraju " scientists in India are usually hesitant to ask questions or get into an open discussion even though they are assured repeatedly that they should not worry about making statements that they think might not sound very smart Speaking out often helps in carrying ones own ideas on their own and other times makes it possible for some one else to help re-direct a problem towards more useful direction".

However, the visit of consultant should be made use of beyond the period of visit by formulation of joint work. Prof. Ghanshyam N. Pandey, University of Illinois, Chicago, USA has reported that several scientists with whom he had discussions have paid a return visit to his center in Chicago which laid the groundwork for collaborative research in several areas. In the present context

(Infrastructure, Software, Chemicals, Technology transfer, Industrial applications, Product/Process development).

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the reverse visit by Indians is considered to be the need by many respondents.

Reverse visits are required to keep pace with the latest developments in the field and also make use of the current research facilities. Today there are several channels for bilateral visit which can be explored for making use of the contact with TOKTEN consultants.

Dr. C R Bhatia suggested that, young TOKTEN consultants from abroad may be invited for training Indian researchers from various institutions in newer techniques of research.

Dr. Bhojwani suggested that there is no need for Governmental intervention in the operation of TOKTEN. It should be left entirely to the information seekers and the information providers to contact each other and operate in the manner they consider convenient, particularly in view of the ICT facilities.

4.8.5. Main host versus User community

Except a few NRIs who had a singular mission for the visit, others have visited more than two institutions for consultancy, lecture etc. It is of interest to know, whether the concept of main host followed by additional visits of consultants to other users was uniformly effective or was it that the additional visits diluted the overall purpose of assignment?

A synthesis of responses reveals that, the additional visits depend on the purpose of the consultancy and the pressure of demand. If planned well, the additional visits do not dilute the overall purpose but add to it. However constraint on time for doing complete justice to the multiple visits is expressed by more than 75 per cent of the respondents. An expert expressed that the number of institutes a TOKTEN expert has to visit are too many, leaving hardly any time for the follow up of a particular plan or experiment. Often one ends up with just presenting a lecture and some discussions, which are frequently not oriented to the institutes problems and solutions! In the words of Dr. T S Prahlad "the present version of TOKTEN programme is highly

satisfactory but it would be more useful if a laboratory would have the expert for about 6 to 8 weeks for more intimate involvement with the chosen R&D programmes".

On a similar note an expert opined that, because of the large number of organization he had to visit, time for in-depth discussions with interested individuals was very short. He feels that, for more effective interaction, adequate time should be allowed for such discussions. This can be accomplished by limiting the number of organizations to a minimum two or three, for a six-week visit.

Barring a very few notable exceptions where the purpose itself was a passing visit, most experts and Indian beneficiaries experienced shortage of time for consultation, as illustrated below. However, Dr. Desiraju has conceded that it was *his* time constraint that limited the duration of his stay in India.

Several user organisations in India expressed that it is important that the experts spend an extended time of one or two months with the secondary places and engage in well-planned research activities which are important to the Indian scientists. This will not only help the Indian scientists but will lead to maintaining a strong tie between the experts and the host laboratory after the visit. The experts may invite students or faculty from the Indian institutions to spend some time in their overseas laboratories to carry out research. Both parties involved can work out the financial aspects. These types of arrangements would help maintain the link initiated by the experts and the host institutions and would be extremely beneficial to all.

As indicated by Dr. Amit Ghosh, in some ways, it may be better to visit a single laboratory for an extended period of time where actual pilot experiments can be performed.

A typical response of an NRI is "The number of institutes a TOKTEN scientist has to visit, in my opinion, is too many. Four to six weeks of time gets divided into too many short visits. This leaves hardly any time for the follow-up of a particular plan or experiment. In a lot of cases because of the short time

assigned for a particular place, one ends up with just presenting a lecture and some discussions, which is frequently not oriented to the institutes problems and solutions. One should stay at least two weeks in one place to carry out a meaningful project".

As a pre-consultancy strategy, a more intense interaction of longer duration (thereby allowing for an iteration and convergence) between the consultant and the specific individual(s) of the host organization has been suggested by Dr. R P Das, prior to the commencement of the assignment.

Towards conservation of time, an expert advised that the programme could probably best be served if the visit is limited to one or two organizations. This would avert loss of a certain amount of time for travel from place to place, and would allow adequate time to interact in a more meaningful way within a given institute, be it discussing experiments, performing experiments, presenting concepts of the field of expertise or simply serving as a consultant. A major teaching component could be established to present the "state of the art" of the expert's field in order to make current the knowledge base and to promote new concepts in research.

Another advice is: "My personal recommendation for future visitors is that they should plan to spend 70% to 80% of their time at one institution and to visit no more than two or three other institution during the rest of the time".

Quite differently, Dr. Chugh has indicated in his reply that if the solution of the main host's problem is developed in concert with others, then the visits to other organizations is most appropriate.

Based on the experiences cited in this section, the guidelines for secondary visits by the expert consultants could be:

- Both primary and secondary visits must focus on a common problem of importance with a long-term goal.
- Additional visits must be kept to the minimum.
- Requires judicious planning and coordination including all the preparations for work by the receiving organizations.

- There should be accountability of the recipients to the consultation sought.

Further, following could be the guidelines for firming up of the procedures for making secondary visits of consultants more productive:

1. Judicious identification of host institution based on gravity of demand vis a vis other demands, its alignment with national objectives, weight of ongoing research in the host institution, availability of resources for future work and the quality of research team.
2. Matching of demand with the credentials of the expert and available R&D base at the host institute.
3. Facilitating pre-visit preparatory groundwork and joint planning.
4. Curbing of dissipative general visits and courtesy calls.
5. Monitoring of follow-up progress.

4.8.6. Demand Driven Versus Supply Driven

The questionnaire survey predominating supports 'Demand driven' approach in selection of consultants. However, a few recommend a mix of 'Demand Driven' and 'Supply Driven' approaches. Hence the implementing agency should play a strategic role of making use of both the choices. The aim should be to arrive at perfect match between the need and the expertise. This requires good knowledge of clients and the resources and appropriate interactions with the two. Dr. Krishna Sapru was invited twice. The second visit allowed follow up and the match was better.

4.8.7. Matching of Expert and the Host

Identification of the problem for which NRI consultant is being sought is most critical and consultant's visits should match needs for solving the problem. A question therefore posed to the consultants was how to improve the matching of expert's knowledge and experience with the needs of the hosts? As pointed out by an NRI in response to our question, matching of interests between an expert and host/users needs promotion of greater exchange of information between a TOKTEN participant and specific individuals at a host institution

whose research and study can be matched to that of the TOKTEN participant. This can take the form of exchange of publications, preprints and correspondence prior to such visits. A multichannel communication, directly between the host and other users with the consultant, should therefore be encouraged. Such exchanges will permit a TOKTEN expert and organization such as CSIR to be more selective in the choice of institutions at which a consultant is to spend time.

Dr. Chugh opines that the key to identify one or two clear problem areas for which one wants to bring in consultants. The consultant should be used to provide some solutions to the problem. These solutions should be openly discussed while the consultant is still there. The adequacy and appropriateness of the solutions should be debated. This was never done. That is where he thinks TOKTEN should be improved.

Prof. Arup Raychoudhury, Prof. Deepak Pental, Dr. H S Maiti, Dr. S C Majumdar and several other Indians and also the NRIs have underscored that the purpose should be well articulated for clarity on both the sides to make the visit productive. Further the purpose should not be lost sight of during the course of consultancy.

A query was addressed both to the consultants and the beneficiaries of the TOKTEN project regarding the extent to which they found the knowledge transfer between the 'knowledge provider' and the 'knowledge receiver' 'matching' each other in terms of its utilization/dissemination, as perceived by transferor or transferee. After discussion with a cross section of scientists, it was decided to have three levels of indicator, viz., `$A^-$', `A' and `A^+'

`A^-'stands for insufficient capacity of the transferee to absorb and utilize the knowledge transferred.
`A' means matching capacity of recipient to utilize the knowledge transferred.
`A^+' stands for surplus capacity of the transferee to receive and make use of the knowledge transferred.

All the expert consultants in the Questionnaire study indicated that the recipients had matching capacity to absorb the knowledge transferred.

Similarly, all the recipients in the sample responded that the matching of expert with their consultancy needs was adequate.

Based on the Questionnaire study, the contribution by the consultant to the host/user organisations may be concluded to be optimal as arrived at in Section 7.5, Chapter 7.

4.8.8. Team Spirit

The basic aim of TOKTEN was transfer of knowledge. The effectiveness of knowledge transfer is enhanced when there is team spirit among the recipients. Team spirit indicates the eagerness of the organization to learn. A question was therefore put whether there was team spirit among the recipients. That is, whether there was professional culture among the recipients supporting and promoting each other's work and share their findings (networking).

While most of the experts acknowledge team spirit among the recipients, example, visit to NML, CGCRI by Bhaskar Sen Gupta, only a few observed that there was not much cooperation among the transferee. However, sharing of information through networking is observed to be poor in India by four of the consultants.

4.8.9. Follow-up and Sustenance of Contact

Most of the visits appear to be for immediate gains. In the present day seamless laboratories, such contacts should be maintained to keep abreast of the advances in the field. But, based on the collective responses from the consultants, post-consultancy follow-up appears to have taken a back-seat. Prof. Chugh has said that:

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"In all my visit, I developed plans of action which were approved but never acted upon. I wrote at least 10 proposals which were considered very timely by Indian counterparts. However, they were never followed through and got diffused. I considered TOKTEN a very good approach to tap knowledge base of NRI. However, it was not administered properly at the local level or at higher levels. ...I myself, and several others that I talked to indicated the same thing...Money or support was never an issue. We all wanted to give something to India in return for our country did for us to educate".

The reason for this was sought from the Indian counterparts whose stake was more. Two things that emerged out of discussions were:

1. Lethargy to go through the office process and selection procedure of TOKTEN experts.
2. Inadequacy of policy of TOKTEN-India to focus on specific problems.

A few of the beneficiaries, particularly from NCL and Snow & Avalanche Study Establishment have continued their contact and have even expanded their reach with the outside scientist and they acknowledge that their understanding is much better after interacting with the expert consultants. It is most desirable that there need to be continuity to consolidate the gains made on initial visit. As a follow-up visit of Dr. Awtar Krishan Ganju has set up a yearly Indo-US Cytometry Workshops to train Indian Scientists in advanced cytometry. The 5th Workshop was held in Biotechnology Department of Punjab University during Feb. 16-19, 2004.

4.8.10. Relevance of TOKTEN today

Considering the present day need for inviting TOKTEN consultant depends on India's progress and need for expert advice in various fields. India is a scientifically proficient country and in certain fields like earthquakes, India still needs help from those having more experiences, with damaging earthquakes worldwide (Dr. Sarada K Sarma).

An NRI expert is emphatic that with experience of nearly 30 years in the area of high-voltage electrical power systems at a well known research institute in Canada, he is better experiences to advise a similar institute in India (Dr. P. Sarma Maruvada). He further points out that, there has not been much work done in India and have not found a resident Indian expert. India is catching up an area of rapid expansion of high voltage electric power grid and the need for indigenous R&D is high. He therefore recommends TOKTEN programme for India to continue.

Besides utilization of state-of-the-art knowledge and creative potential of NRIs, their guidance in shaping the S&T policy of India and to remain up-to-date in knowledge with the advanced countries is the need of the hour. The Department of Biotechnology and The Ministry of Information Technology have eminent NRIs and people of Indian origins in their Advisory Panels for catalyzing technologies and investments into India. An S&T Expert Group under the GOI initiative has recommended launching and managing Web-based registration of STIO abroad; setting up of joint venture companies in India with technologies sourced in by STIO abroad; establishment of green corridors for joint ventures in selected high tech areas; scheme for visit of distinguished STIO to India on specific assignments on the model of Fogarty Scholars in Residence of National Institutes of Health, USA.

A New TOKTEN seems to be already on the anvil with the recommendation of High Level Committee set up by the GOI to launch a scheme for contact programme of STIOs with Indian peers. Under the scheme hosting of 100 to 150 visiting scientists annually from abroad was suggested to be worked out by the DST. The S&T Expert Group has suggested a model format/information grid for database on active overseas Indian researchers for uploading by DST on Internet.

Further, the S&T Group recommends provision for visit of overseas scholars and research consultants for advising on Indian research and technology development projects. Accordingly, it has advised the Indian Scientific Agencies providing funds for extramural research to consider revising their

application form to contain a section on Visiting Faculty or Research Consultant.

From the foregone, the past consultancies under TOKTEN have been for providing advice, direction; state-of-art report, transfer of know-how, joint R&D work; technology transfer, etc. Today's requirements are reverse visits of young Indian scientists to specialized institutions abroad for advance training and exposure to research with focus on strategic sectors of Indian economy and joint technology development.

In summary, the emerging view of new TOKTEN would be:

- Web-based institutional framework
- Local chapters of TOKTEN experts on a global scale networked
- Proactive Interaction with TOKTEN in other countries must be interconnected.
- Linkage with other related institutionalized framework and industries in developing countries.
- Linkages at various levels, like-
  - Centers of Excellence in India with alumni-based NRIs,, STIO, PIO
  - Professional bodies & associations in India with their counterparts abroad
- Catalyze setting up of joint venture companies in India with technologies sourced in by STIO abroad
- Promote visit of overseas scholars and research consultants for extramural research
- Facilitate reverse visits of young Indian scientists to specialized institutions abroad for advance training and research with focus on strategic sectors of Indian economy and joint technology development.
- Make the programme self-sustaining.

Chapter 5

The Umbrella Project

5.1. TOKTEN Programme to Umbrella Project—The Transformation

In India, several S&T programmes were operating simultaneously with similar aim. In the context of UNDP funding, the TOKTEN, TCDC and UNISTAR were operating concurrently but as separate stream. Simultaneously, the bilateral and multilateral programmes co-existed. As mentioned earlier, the primary purpose of the TOKTEN programme was to facilitate a two-way communication and partnership between expatriate knowledge providers at the cutting edge of science and technology and knowledge seekers in India. TCDC is quite popular for fostering, promoting and sustaining technical cooperation among developing countries. Through UNISTAR, Indian industry often sought the expertise of developed countries.

Bilateral and multilateral programmes facilitated joint research and development work and also exchange of scientists under approved Memoranda of Understanding and inter-governmental agreements. As can be seen, the objective of all these programmes, pursued independently, was more or less the same, that is, to raise the level of S&T development of India, and promote development. The efforts put in were dispersed resulting in diffused yield and synergistic potential lay untapped. When the three individual programmes (TOKTEN, UNISTAR and TCDC) were brought together under a common umbrella and operated in a well-orchestrated Project mode, synergy got added to each component and together they generated greater impact. Linkage of the Umbrella Programme with bilateral programmes resulted in further value addition. The project unification thus opened new vistas by broadening and deepening the base for pursuing any given activity under the programme.

In addition to the much-needed synergy, the pooling of project hastened the pace for institutionalization of certain selected activities like Herbal Drugs and Natural Disaster Mitigation.

The stipulated development objective of this Project was to facilitate and make available to India advance technological know-how, specialized skills and highly qualified experts on voluntary basis to address key development areas and identified problems and issues with a view to upgrading the country's level of science and technology, promoting their applications and commercialization, enhancing productivity and improving the quality of goods and services particularly of small and medium enterprises thereby contributing to sustainable human resource development.

The Umbrella Project was scheduled to commence in January 1996. However, decision on priority areas, firming up of the work plan, streamlining of procedures and overcoming of teething troubles took time and the project activities could only be launched in October 1996 [CSIR, 1997].

The aims of the Umbrella Project were:

- To address key problems and issues of development or upgradation of country's S&T level
- To promote S&T applications and their commercialization, and
- To enhance industrial productivity and improve the quality of goods and services for the economic upliftment of India.

The components of the Umbrella Project are introduced below:

5.1.1. Technical Cooperation among Developing Countries (TCDC)

The TCDC concept was launched at the 27th session of the UN General Assembly in January 1973, as the voluntary sharing of experience between two or more developing countries for their mutual development. TCDC activities are initiated, managed and principally financed by the partner developing countries themselves with UN organizations and other external donors playing a catalytic and supplementary role. It is expected to mobilize

expertise through seminars, workshops and training programmes that would facilitate formulation and implementation of national programmes of vital importance to the country for economic, social and human resource development, including private sector development. The main objective is to promote India's cooperative arrangements with other developing countries for mutual exchange of information and expertise thereby facilitating human resource development, transfer of know-how between developing countries and enhancing national and collective self reliance.

5.1.2. United Nations International Short-Term Advisory Resource (UNISTAR)

Initiated and funded by UNDP, the UNISTAR programme makes available to the developing countries a pool of international expertise from professional organizations and private industry. The programme has helped to establish a global network of advisors and supporting organizations, usually made up of retired business professionals with practical and relevant experience. Since 1985, UNISTAR has provided experts in a wide range of technical and management services, from engineering to product development, industrial design, manpower, marketing and quality control, business administration, accounting and financial restructuring in over 50 countries. UNISTAR experts serve on voluntary basis, however, the cost of travel and subsistence are reimbursed by the host enterprises in the developing countries. Since the small and medium enterprises in India are unable to bear the travel and subsistence costs of such experts, the UNDP meets these expenses. The UNISTAR–India programme was launched in India in 1991, and since then, 27 UNISTAR missions have been fielded. The facilities and services of the UNDP, New York, were made available in the implementation of the project.

There was a yet another effort to mobilize expatriate Indians for industrial development by launching MEIID described below.

5.1.3. Mobilizing Expatriate Indians for Industrial Development (MEIID)

As mentioned in Chapter 2, in the literature survey, Liberalization policy of the Indian Government in 1991 and globalization of economy provided easier access to resources like free import of latest technologies from abroad, joint ventures and setting up of multinational companies in India. Firms and organization in India responded to market reforms by improving efficiency, importing technology and by increasing in-house R&D. This required boosting of utilization of S&T by the industries. Secondly, a change in conception from "cradle-to-grave" (the linear approach of pure research through development and commercialization in linear mode) to more realistic 'some overlap'-US model to 'completely superimposed'-Japanese model between the three stages had to be introduced in India. Consequently the need for additional foreign consultancy directed towards helping the Indian industries in induction of S&T and improved delivery system was necessary. Hence, a second window of TOKTEN, though in complete isolation, was initiated for Mobilizing Expatriate Indians for Industrial Development (MEIID) on a pilot basis in 1992. This project focused on channeling the specialized skills and expertise of expatriate Indians to enterprises in the public and private sectors as well as social science research institutions, which needed technical know-how but could not meet the costs of international travel and living expenses of the experts. Seventeen experts were fielded under the MEIID project, implemented by the National Council for Applied Economic Research (NCAER). The project provided managerial, technical and marketing advisory services to industrial enterprises and social science research institutions. The maximum duration of such services under this Project was one month.

5.1.4. Feed Forward from the Past Experience

The accumulated experience of managing TOKTEN, UNISTAR, TCDC and MEIID underscored the need for the following [UNDP, 1996]:

- Identification of key focus areas in line with national development priorities and their fine tuning;
- A sound action plan with well-defined project deliverables and well articulated progress monitoring and evaluation mechanisms;
- Down to earth connection between the three component programmes, and possibly others;
- Shift of focus from basic R&D to industrial R&D and direct industrial applications; and,
- Attainment of Sustainability.

5.2. Framework of implementation

A Task Force of 14 members chaired by late Dr Parvinder Singh, Chairman, Ranbaxy Laboratories Ltd, was setup to (a) identify key focus areas (b) formulate the programme implementation framework, to build up linkage and partnerships with industry and others, ensuring project mode implementation and with consortium approach (c) workout an action plan for most effective utilization of expertise and resources and achieve long term sustainability (d) determine methodologies to provide holistic input to a large system of R&D institutes/industries to achieve targeted results in R&D, value addition and problem solving.

The Task Force comprised eminent members from Academia, Industry, UNDP, Government Ministry/Department etc. (Appendix 6). Several basic questions and issues raised by various parties including UNDP, CSIR and MEA were examined with a view to ensure that the three components reinforce each other and the programme becomes truly demand-driven. Some of the basic questions and issues considered are reproduced below [UNDP, 1996]

5.2.1. Basic Questions asked and Issues raised

- What should be the most appropriate framework for implementation of the Umbrella Programme taking in to account the present position and strength of R&D systems and the known/perceived requirements of the industries?
- What roles and responsibilities should be assigned to the partners in the overall framework noting CSIR's latest objectives/vision and its industrial linkages/commitments?
- What type of formal relationship (MOU or subcontract arrangement) should be established between CSIR (the main implementing agency of Umbrella Programme) and such other partners?
- How to ensure accountability and responsibility in such relationships?

- What should the methodologies of operation be to ensure holistic inputs through the component programmes individually and jointly? How could different tasks/agencies be coordinated for synergy?

5.2.2. Identified Areas of National Priority

The Task Force identified eight priority areas and one intersectoral niche area, applicable equally to all the three components, viz., TOKTEN, UNISTAR and TCDC. Later, "Health" was added as Intersectoral niche area. Further Disaster mitigation, Leather technology and Application of Biotechnology in Agriculture, Environment & Health was added to this list, for receiving primary attention as user priority areas under any of the components.

Some of the major recommendations of the Task Force were as follows [UNDP, 1996]:

- All activities must be restricted within the stipulated priority areas. The priority areas identified would apply equally to all the three components viz., TOKTEN, UNISTAR and TCDC.
- In the priority and intersectoral areas, to stay focused, some fine-tuning should be attempted through the Programme Steering Committee and National Project Coordinator.
- Coordination mechanism should be efficient in every way. CSIR should ensure effective coordination with appropriate ministries on one hand and the focal points/subcontracted agencies on the other.
- While CSIR should be the main implementing agency, specific responsibilities and roles were assigned to the focal points. For the TOKTEN, eight focal points were recommended. For the UNISTAR, CII and FICCI were to share the eight priority areas. For the TCDC, CSIR was to take assistance of expert agencies.
- Workshops and seminars should cease to be stand alone activities and become integral parts of the components of the Umbrella Project.
- A brainstorming session should be convened in Delhi, involving focal points and members of industry associations so that they could spread the concepts to a larger audience with a view to generate ideas, proposals and recommendations in the matter of inviting experts, etc.
- CSIR's database on TOKTEN should be strengthened and steps taken to integrate the components for UNISTAR and TCDC.

Programme J

Priority Areas Identified

❶

Fermentation technology & its applications

❷

Environment & Pollution problems

❸

Information technology

❹

Automotive components manufacturing technology

❺

Process technology

❻

Textiles & Fibres

❼

Food processing for value addition

❽

High performance construction and special materials

❾

Intersectoral niche areas

&

User priority areas under any of the components to be decided in consultation with NPD

Figure 1: Priority Areas identified by the Task Force

5.3. Organizational setup of the Umbrella Project

The Umbrella Project was implemented with the Director General of CSIR as the National Project Director (NPD). The UNDP and the Department of Economic Affairs (DEA), under the Government of India, were the two arms of the NPD. The UNDP, CSIR and DEA were primarily concerned with the capacity building, overall economic development of the nation and monitoring, respectively. The Programme Policy Committee (PPC) and the Project Steering Committee (PSC) along with their sub-committees facilitated the NPD in deciding the policy and the implementation matters of the project.

Programme Policy Committee (Appendix 6) was set up to (a) provide overall guidance and advice for implementation of the Umbrella Programme ensuring the consortium approach (b) Identify key focus areas and constantly tune them to the national priorities(c) approve the overall work plans, programmes and implementation mechanisms (d) conduct biannual reviews of the progress It was chaired by the Director General of CSIR, designated as the National Project Director (NPD). The NPD was assisted by a National Project Coordinator (NPC).

To speed up action and yet retain objectivity, a Programme Policy Sub-Committee facilitated decision-making on all policy matters and related action plan of the Umbrella Programme. It provided policy direction to PSC, if and when required and took such steps as were necessary to monitor and steer the Umbrella Programme, and apply mid course corrections, if and when required.

Programme Steering Committee (Appendix 6) was asked to (a) evolve Annual Work Plans within the frame work of policy decisions of programme implementation (b) develop and recommend criteria for processing the consultancy assignments, selection of experts (c) guide NPC on smooth and effective implementation of the programme and (d) render advice in formulation of MOUs & subcontracting arrangements. Please see Figure 2 for the interconnections

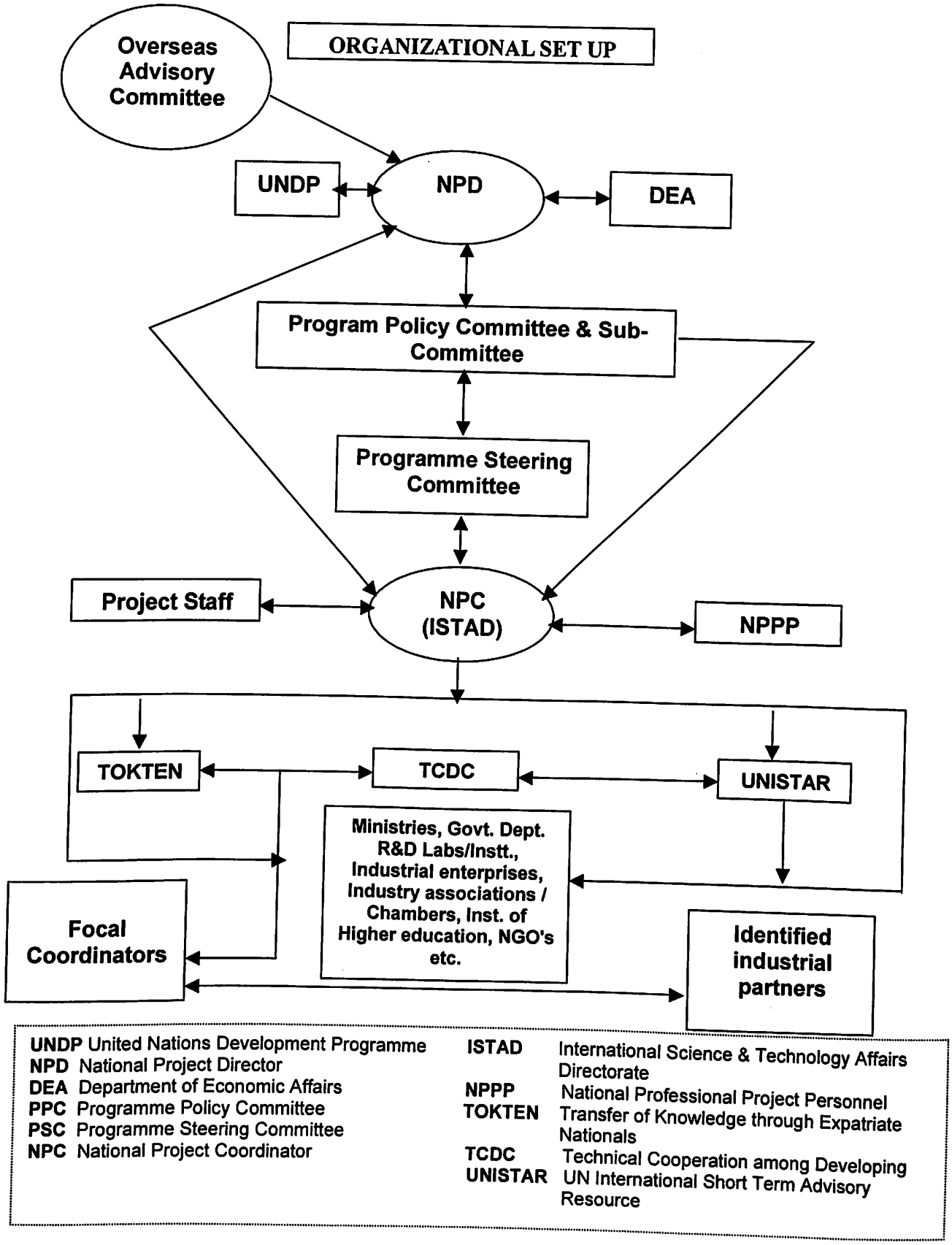

Figure 2: Organizational set up of UNDP- GOI Umbrella Project

A rigorous system of selection of experts was introduced. For independent TOKTEN stream the selection was through a High Powered Selection Committee (HPC), while for well-defined missions, like the TCDC workshops, a 'Screening Committee', constituted for each mission, integrating the three streams, selected the consultants. The High Powered Committee ensured selection of experts strictly according to the prescribed criteria and recommended improved mechanisms of selection, and initiatives and innovations in improving the project yield, and utility factor of experts

The National Project Coordinator (NPC) was responsible for networking with the various components of the project namely the TOKTEN, TCDC and the UNISTAR consultants, the beneficiaries, the funding and the monitoring agencies (UNDP and DEA). The NPC, along with his CSIR team members, was responsible for drawing out the plan of work including budgeting, arranging meetings of the project committees including participating in the tripartite review meetings with the UNDP and the DEA, provide the necessary information like the periodical progress reports and also assist the NPD in taking the final decision regarding the policy and implementation matters related to the Project [CSIR, 1997].

Premier national level institutions like the CSIR laboratories; universities and the industries raised demand for experts and also acted as hosts for organizing the project activities. Simultaneously, they were also the beneficiaries under independent TOKTEN, UNISTAR or TCDC stream. Besides, the institutes of higher learning, viz., IITs and IISc Bangalore; the Government Departments/Ministries, namely, the Department of Science & Technology, the Department of Biotechnology, the Ministry of External Affairs; the industrial associations like the Confederation of Indian Industries (CII), the Federation of Indian Chambers of Commerce and Industries (FICCI) and the Associated Chambers of Commerce and Industry in India (ASSOCHAM) provided guidance to the Project as the members of the Project committees.

The progress was rigorously monitored by an annual Tripartite Review (TPR) .It was held under the Chairmanship of Director General, CSIR with the representatives of UNDP and Department of Economic Affairs as members.

5.4. Project Implementation

International Science and Technology Directorate of CSIR, at the very outset, put together a dedicated team of professionals to achieve/deliver:

- Improved co-ordination and management;
- reinforcing of linkages and creation of synergy between TOKTEN, UNISTAR and TCDC
- strict adherence to and adequate spotlight on priority areas and alignment and constant fine-tuning of the Umbrella Project with the national development priorities
- a consortium approach to programme implementation with proactive involvement of R&D institutions, industry and nodal organizations
- greater orientation towards R&D applications, and human resource development, as well as training with industrial bias
- down-to-earth connection with the other ongoing national programmes
- pro-active participation of industry and change of gear from 'supply push' to 'demand pull'

A total of 470 TOKTEN experts had visited India during 1980-95, all under independent stream. This number included 66 revisits that demonstrate sustained linkage. The scenario dramatically changed when TOKTEN, UNISTAR and TCDC experts shared a single platform, as for example at thematic workshops (Table 4). Ten eminent women scientists also contributed immensely to this project. Simultaneously the original virtue of TOKTEN-India was retained by (a) extending stay of TOKTEN experts to take on other capacity building initiatives (b) organizing stand-alone TOKTEN visits to meet very specific demands from frontline Indian Institutions. Such visits numbered 48.

Table 4. Pooling of Expertise under the TOKTEN Umbrella Project (1996-2001)

Stream	Shared Platform
TOKTEN	33
UNISTAR	30
TCDC	154

Two Workshops were organized in other developing countries with Indian resource persons. In Iran, 88 participants and in Nepal, 55 participants attended the workshops. One Workshop was exclusively organized for the participants from the developing countries with majority of resource persons from India.

5.5. Programme Investments

5.5.1. UNDP

Table 5. Investments during Different Phases of TOKTEN/Umbrella Project (1980-2001)

Phase and Period	Investment (Million US $)	Number of visits of TOKTEN Experts	Number of visits of TCDC Experts	Number of visits of UNISTAR Experts
I (1980-1982)	0.2	54	Not applicable	Not applicable
II (1984-1989)	0.92	203	Not applicable	Not applicable
III (1990-1992)	0.5	115	Not applicable	Not applicable
IV (1992-1995)	1.0	98	Not applicable	Not applicable
V (1995-2001)	1.0	81	154	32
Total	**3.62**	**552**	**154**	**32**

GOI provided matching support in kind.

Source: TOKTEN Brochure, Nov. 2000, pp 36 [CSIR, 2000]

The UNDP investment for the project is given in Table 5. It met international and domestic travel costs and the per diem allowances of the Consultants recommended by the selection committee of the TOKTEN programme. Each consultancy covered duration of one to twelve weeks. The large number of visits of the expert consultants during the second phase(1984-1989) in Table 5 may be attributed to the fact that the launching experience generated the need

to well plan the second phase particularly to meet the upcoming need to establish the then emerging areas like biotechnology, supply of biochemical, communication and IT.

5.5.2. Government of India

Government of India provided the oversight and patronage. The Project was initially approved for three years beginning January 1996, but extended three times and ultimately up to June 2001, without additional funding from the UNDP [Minutes of Terminal Tripartite Review meeting, Unpublished]. It also facilitated linkage between TCDC and TOKTEN.

5.5.3. Council of Scientific and Industrial Research

CSIR provided matching support to the project in kind. All costs on the dedicated project team, secretarial and communication expenses, transport and on use of office spaces were covered by CSIR. It was the principal counterpart organization of the Government of India for this project, where a CSIR team provided the administrative and operational services for the implementation of TOKTEN programme from 1980 to 2001, besides its publicity. The R&D expertise and the institutional facilities in its constituent institutions were also utilized for this Project.

5.5.4. Beneficiaries

The entire country became the constituency of the TOKTEN umbrella programme. There were a large number of Indian organisations, from R&D and academic institutions to Industries and industrial associations came forward to seek expert advice from top class invited overseas expert consultants including those invited under bilateral programmes. There was also targeted audience like the small and medium enterprises whose demands were met.

5.5.5. Experts Invited and Areas Served

The distribution of TOKTEN experts by field of their specializations and country of residence for the period 1996-2000 is shown in Table 6.

Table 6. Distribution of TOKTEN Experts by Field of Specialization and Country of Residence (1996-2000)

Specialization	USA	Canada	UK	Others*	Total
Life Sciences					
Biochemistry	3	-	-	-	3
Biomaterials/Biotechnology	1	1	-	-	2
Biophysics	-	-	-	-	1
Cataract	1	-	-	-	1
Experimental Therapeutics	1	-	-	-	3
Food Science and Technology	1	1	-	-	2
Genetic Engineering	2	1	-	-	3
Immunology	2	-	-	1	3
Medical Science	-	-	1	-	1
Microbiology	2	-	-	-	2
Molecular/Cell Biology	2	-	1	-	3
Parasitic Diseases	1	-	-	-	1
Pharmacology	3	1	-	-	4
Physiology	-	1	-	-	1
Toxicology	1	-	-	-	1
Zoology	1	-	-	-	1
Total	**21**	**5**	**2**	**1**	**29**
Chemical Sciences					
Batteries/Fuel Cells	2	1	-	-	3
Biochemistry	1	-	-	1	2
Catalysis	-	1	-	1	2
Chemistry	3	1	-	1	5
Corrosion	1	-	-	-	1
Electrochemistry	1	-	-	-	1
Organic Chemistry	1	-	-	-	1
Polymer Chemistry	1	-	-	-	1
Total	**10**	**3**	**-**	**3**	**16**

Contd.

Specialization	USA	Canada	UK	Others*	Total
Engineering and Technology					
Chemical Engineering/Technology	1	2	-	1	4
Civil/Structural Engineering	1	1	-	-	2
Coal management	1	-	-	-	1
Communication Systems/Telecom.	2	-	-	-	2
Design Engineering	1	-	-	-	1
Disaster Management/Landslide	-	2	-	2	2
Electrical/Electronics/Computer Engineering	-	1	-	-	2
Glass and Ceramics	-	2	-	-	1
Material Science/Engineering	4	1	-	2	8
Mechanical Engineering	4	1	-	2	5
Metallurgical Engineering	3	-	-	-	1
Mining Engineering	3	-	-	2	5
Nanotribology	1	-	-	-	1
Rock Mechanics	1	-	-	-	1
Rural Development	-	-	-	-	1
Structural Engineering	3	-	-	-	3
Total	**23**	**9**	-	**8**	**40**
Science Management			-		
Business Development	1	-	-	1	2
Decision Making	1	-	-	-	1
R&D Management	-	-	1	-	1
Technology Transfer	-	-	1	-	1
Time Management	1	-	-	-	1
Quality Management	1	-	-	-	1
Total	**4**	-	**2**	**1**	**7**
Grand Total	**68**	**18**	**4**	**13**	**110**

* Includes Australia, Bangladesh, Brazil, France and Malaysia.

It was observed that during 1996-2000, out of 110 TOKTEN experts, 68 were from the USA followed by Canada (18). A small number of experts visited from Australia, Bangladesh, Brazil, France and Malaysia. Area-wise the maximum demand was in the field of Engineering and Technology (40 experts out of 110) followed by Life Sciences (29 experts). The other areas in which the experts were invited could be grouped as Physical and Applied Sciences (16), Chemical Sciences (16) and Science Management (7).

The data in Table 6 overlaps two plan periods, eighth five year plan (1992-97) and ninth five year plan (1998-2005). During these periods the economic development of India the plan documents stated "For rapid economic development, the priority sectors ... are power, transport and communications..." As may be seen in Table 6, no specialist in the area of power and transport was sought and only two experts (out of sixty-eight) in the area of communication systems/telecommunication were demanded. This can be attributed to lack of awareness about the programme and inertia of the system as a whole.

Looking from another angle the ultimate goal of the eighth five-year plan was 'Human development', which has been the outcome under several of the planned activities. Considering agricultural development, eradication of illiteracy, provision of safe drinking water as the basic needs of India, the 'demand pull' needed correction to cover these areas of importance to the nation and further as suggested in the Lobell report, "The country's scientific and technological base, therefore, has to have the capability to move its efforts more quickly towards the application end of the innovation pipeline" [UNDP, 1994].

It is seen from the three joint evaluation mission reports that that engineering and technology was the area of specialisation of most of the TOKTEN consultants (47%), out of which most of consultants were from the sub-field of electrical, electronics & computer engineering (31%). 21 experts were fielded in 'Health care' sector and experts. This is also brought out in the joint evaluation reports [UNDP, 1988; UNDP, 1994].

5.6. Contributions of Umbrella Project

The Umbrella Project yielded synergistic gains by virtue of integration of the multiple programmes, viz. TCDC, UNISTAR, bilateral programmes etc. Table 7 shows how the three components have supplemented each other. For example 1 NRI, 2 experts from industries and 29 experts from developing countries could share a common platform to act as resource persons in the TCDC workshop on 'Application of on-line instrumentation in Pulp & Paper, Leather and Food processing industries', meeting varying needs of the participants.

Table 7: Number of Overseas Experts in the three Streams of Umbrella Project Serving the Same Cause

	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7*	WS-8	WS-9*	WS-10
TOKTEN	4	1	5	2	2	-	-	4	-	2
UNISTAR	3	2	2	2	2	-	-	3	-	1
TCDC	2	29	5	21	5	2	-	19	-	16
TOTAL	9	32	12	25	9	2	-	26	-	19

	WS-11	WS-12**	WS-13**	WS-14	WS-16	WS-17	WS-18	IS	TOTAL
TOKTEN	1	2	-	2	2	3	3	48	81
UNISTAR	3	-	2	7	2	1	-	2	32
TCDC	8	14	17	1	8	2	5	-	154
TOTAL	12	16	19	10	12	6	8	45	267

WS-1 TCDC International Workshop and Training Programme on **Hydrogen Energy and Related Technologies**
Banaras Hindu University, Varanasi
November 29-December 1, 1996.

WS-2 TCDC International Workshop on **Application of On-line Instrumentation in Pulp and Paper, Leather and Food Processing Industries**
CEERI Centre, Chennai
February 3-11, 1997.

WS-3 TCDC International Workshop on **Advances in High Performance Concrete Technology and Its Applications**
SERC, Chennai
April 16-18, 1997.

WS-4 TCDC International Workshop cum Training Programme on **Herbal Drugs**
RRL, Jammu
September 18-22, 1997.

WS-5 TCDC International Workshop on **Application of Biotechnology in Bio-fertilizers and Bio-pesticides**
IIT, Delhi
October 15-18, 1997.

WS-6	Brain Storming Session on **Identification of Technology Needs of Small and Medium Enterprises in Developing Countries** COSTED Central Secretariat, Chennai June 1-2, 1998.
WS-7*	International Workshop on **Technological Upgradation in Food Processing Leather, Pulp and Paper** Mashad, Islamic Republic of Iran June 14-18, 1998.
WS-8	TCDC International Workshop on **Surface Engineering and Coatings** NAL, Bangalore June 25-30, 1998.
WS-9*	TCDC Workshop on **Herbal Drugs and Aromatic Plants** Kathmandu, Nepal October 7-9, 1998.
WS-10	TCDC Workshop cum Training Programme on **Food Processing for Value-Addition, Health Care and Nutrition** CFTRI, Mysore October 22-24, 1998.
WS-11	International Workshop cum Training Programme on **Landslide Hazard and Risk Assessment and Damage Control for Sustainable Development** CRRI, New Delhi November 6-15, 1998.
WS-12**	TCDC International Training Workshop on **Emerging Trends in the Diagnosis of Infectious Diseases** CDRI, Lucknow December 7-12, 1998.
WS-13**	TCDC International Workshop on **Management of Innovation from Concept to Commercialisation** IPFT, Gurgaon December 21-24, 1998.
WS-14	International Consultation Meeting on **Technology and Environmental Upgradation in Indian Leather Sector** India Habitat Centre November 29-30, 1999.
WS-15***	International Workshop on **Technological Upgradation of Drugs, Pharmaceuticals and Agro-chemical Industries** for Global Competitiveness IICT, Hyderabad November 30-December 4, 1999.
WS-16	International Seminar on **Environmental and Waste Management in Iron and Steel Industries** National Metallurgical Laboratory Jamshedpur, December 2-3, 1999.
WS-17	TCDC Workshop on **Natural Disaster Reduction: Policy Issues and Strategies** Structural Engineering Research Centre, Madras December 21-22, 1999.
WS-18	International Workshop on **Sustainable Strategy for Promoting Export Competitiveness in Knitwear Industry** Tirupur, August 23-25, 2000

WS	Workshop (specially being organized depicting synergy amongst TOKTEN, UNISTAR & TCDC – the three components of Umbrella Programme)
IS	Independence stream of TOKTEN Programme (other than Workshop)
TOKTEN	Transfer of Knowledge Through Expatriate Nationals
UNISTAR	United Nations International Short Term Advisory Resources
TCDC	Technical Cooperation Amongst Developing Countries
*	Workshop organized in other developing countries with Indian resource persons. In Iran, 88 participants and in Nepal, 55 participants attended the Workshop.
**	Workshops exclusively organized for participants from the developing countries with majority of resource persons from India.
***	Not included in Table 7 as the break up of consultants was not available.

A complete Calendar of activities (Meetings and Events) is placed at Appendix 7 [Bhandari, R K; 1999].

Yet another innovation achieved was to register intimate partnerships and reduce costs. The best example of this is provided by partnership with the Asian Pacific Centre for Transfer of Technology (APCTT), which alone added 27 participants from as many as 10 developing countries to support a thematic workshop. The countries represented were Bangladesh, China, Iran, Malaysia, Mongolia, Nepal, Philippines, Sri Lanka, Thailand and Vietnam from R&D institutions (14), Industries (8), Academia (3), S&T Agencies (1) and Unaffiliated independent participant (1). Further strength could be added by inviting two consultants from Austria and Sweden respectively under the UNISTAR, and one consultant from U.K and one consultant each from China, Sri Lanka and Korea. Besides the foreign consultants, ten Indian resource persons added their own weight.

A major contribution of the Umbrella Project was the institutionalization of two of the Umbrella activities on Herbal Drugs and Natural Disaster which not only sustained these two key activities pursued under the Project but helped in achieving a nation wide attention. The significance of this achievement is so large that Chapter 6 is wholly devoted to institutionalization and sustainability aspect of the Project.

5.6.1. Major TCDC Workshops, International Seminars and Meetings Organized under the Umbrella Project

Eighteen International TCDC Workshops Seminar and Meetings were organized (Figure 3):

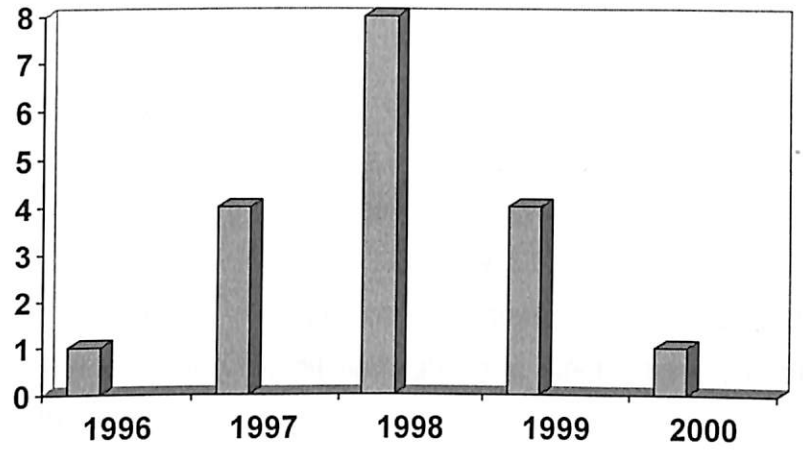

Figure 3: International Workshop Organized during 1996-2000

As in Table 7, in all, 81 experts under TOKTEN, 32 experts under UNISTAR and 154 experts under the TCDC were fielded for 18 international TCDC workshops/meeting, besides the following two TCDC stand alone activities (other than synergy stream):

- TCDC International Training Workshop on 'Emerging trends in the diagnosis of infectious diseases' held at CDRI, Lucknow during December 7-12, 1998.

- TCDC International Workshop on 'Management of innovation from concept to commercialization' held at IPFT, Gurgaon during December 21-24, 1998.

The participants in the above two workshops were from the developing countries, while the faculty was mostly from India. Thus, these two activities were undertaken exclusively for giving further impetus to the cooperation amongst developing countries.

It may be noted that, except the TCDC consultants who were invited for the Workshops only, the TOKTEN and UNISTAR experts additionally pursued individual consultancy mission to R&D systems and industries.

The first major project event under the Umbrella Program, namely the workshop on **Hydrogen Energy and related Technologies held at Banaras Hindu University, Varanasi**, gave a good feel of the tremendous potential latent in the unification of TOKTEN, UNISTAR & TCDC Components of the Project. Proactive involvement of Industry, Academia and Research & Development Personnel, all spotlighting a single theme, added substantial glow to the Workshop.

The second major event, taken up under the Project, addressed the vital subject of **Application of "On-line Instrumentation in Pulp & Paper, Leather & Food Processing Industries" held at Central Electronics Engineering Research Institute, Chennai.** The yield of this Workshop improved even further, because of the concord with the Asian & Pacific Centre for Transfer of Technology (APCTT), concerned equally with the theme of the Workshop. This single new initiative of associating the APCTT enriched the substance of Workshop, facilitated participation of an additional 27 Experts and participants from as many as 13 developing countries, (off loading the international travel and part printing costs to APCTT). Such a move also made its possible to address the issue of sustainability, more effectively.

The third major event namely **"Advances in High Performance Concrete Technology & its Applications" held at SERC Chennai** stretched the ambit of partnership still further, well beyond the realm of the Umbrella Programme

by tapping resources of the Department of Science & Technology, and others, to partially support participants from developing countries like Sri Lanka.

The above new initiatives and their synergetic influence, added enormously to the momentum to the fourth event: **Herbal Drugs held at RRL, Jammu (18-22 September 1997).** It was a great success, by additionally facilitating participation of CSIR's bilateral partners, without burdening the Umbrella Project with costs on international travel. In most cases, even the hospitality component was covered by CSIR inputs. The cost-effectiveness of the Workshop was thus greatly improved. What is more, continued association of APCTT in this event too (as also in the subsequent event on Biotechnology) amply proved the point that it is not hard to sustain meaningful partnerships and that the sky is the limit to which fruits of synergy could be realized through networking and imaginative project implementation. The workshop led to signing of a MOU, repeat of training programme, and another workshop on the subject conducted at the request of UNIDO.

The fifth event was taken up under the GOI-UNDP Programme addressed the vital subject of **Application of Biotechnology in Biofertilizers and Biopesticides held at IIT, Delhi**. This workshop demonstrated the use and utility of biotechnological approaches to agriculture such as genetic manipulation of plants and use of biological materials in place of chemical fertilizers and pesticides. A training programme of two days duration preceding the workshops for the benefit of participants from India and other developing countries had also been organized to give field label demonstration and practical training in this area.

In the context of global technology scenario and the new economic and trade regimes, Identification of the critical technological needs of Small and Medium Enterprises is the prerequisite to formulate and appropriate technology management strategies. Keeping this in view **A Brainstorming session on Identification of Technology Needs of Small & Medium Enterprises for Developing Countries** was organized as a sixth event under the GOI-UNDP Umbrella Project.

As a follow up of international Workshop On Application of On-line instrumentation in Pulp & Paper, Leather & Food Processing Industries an **International Workshop on Technological Ugradation in Food Processing Leather, Pulp & paper was organized at Mashad, Islamic Republic of Iran**. This was the seventh event under the GOI-UNDP Umbrella Project.

The eighth major event organized under the GOI-UNDP Umbrella Programme was on **Surface Engineering & Coatings held at NAL, Bangalore.** During the Workshop a conscious attempt had been made to bring together representatives from a large number of related industries in the country, scientists and technologists working in different R&D laboratories, policies planners of the Govt. of India and resources persons/participants from a number of developing and developed countries. This workshop has also led to establishment of Indian National Society of Surface Engineering, besides providing the stimulus to the related industries.

The event on Herbal Drugs held at RRL, Jammu had indeed triggered windfalls. Request for repeat of similar programme was received from Nepal and an **International Workshop on Herbal Drugs and Aromatic Plants** was organized at Kathmandu, Nepal in association with APCTT.

The tenth event i.e. **International Workshop on Food Processing for Value Addition, Health Care and Nutrition** was organized at CFTRI, Mysore. The objective of this workshop was to initiate action for wider regional cooperation in the Asia-Pacific area, especially for value addition to foods, imparting nutrition security, preventing food losses by product utilization, and food industry waste management through adoptable, cost-effective, eco-friendly, energy-efficient, water-conserving, traditional and modern technologies which can fit into the traditional cuisine and practices.

The eleventh major event i.e. an **International Workshop cum Training Programme on Landslide Hazard and Risk Assessment and Damage**

Control for Sustainable Development including field visits was organized at CRRI, New Delhi with the aim of sharing of national regional, global experiences to address the multidimensional problem of landslide in India and other developing countries.

The twelfth event i.e. **an International Training Workshop on Emerging Trends in the Diagnosis of Infectious Diseases** was organized at CDRI, Lucknow. The Workshop focused on sharing of knowledge and exchange of information on changing patterns of Infectious Diseases, their diagnosis and treatment.

The thirteenth event i.e. an **International Workshop on Management of Innovation from Concept to Commercialisation** organized at IPFT, Gurgaon focused on the Training Programme on Protection and Exploitation of Intellectual Property Rights of Innovations, networking in the area of Management of innovation and the innovation in management of Capital and Service Sector etc.

The fourteenth event i.e. **International Consultation Meeting on Technology & Environmental Upgradation in Leather Sector** was organized at India Habitat World, New Delhi. The Workshop focused on tackling the problems of TDS and solid waste with both short and long term perspective and constant efforts for improvement of existing processes and introduction of new processes to achieve continuous improvement through pollution control & prevention, cost effective operation & maintenance of effluent treatment devices.

The fifteenth event i.e. an **International Workshop on Technological Upgradation of Drugs/Pharmaceuticals & Agro-chemical Industries for Global Competitiveness** was organized at IICT, Hyderabad. The objective of this workshop was to bring in various options available for technology upgradation in small and medium enterprises. It is due to the fact that The SMEs in speciality chemical sector in developing countries are in tremendous strain both from technological, environmental and economic considerations.

Technology upgradation can alone provide solution to face these challenges. If timely assistance (2005 is not far off) is not provided through national and international endeavours, the SMEs are likely to face extinction under market economy driven conditions.

The sixteenth event i.e. an **International Workshop on Environment and Waste Management in Iron and Steel Industries** was organized at NML Jamshedpur. The workshop focused on the development of inexpensive, cost affective and cleaner technologies and procedures, which are affordable by small and medium scale industries.

The seventeenth event i.e. an **International Workshop on Natural Disaster Reduction: Policy Issues and Strategies** was organized at SERC, Chennai as a follow up of the International Workshop on Landslide Hazards and Risk Assessment organized at CRRI, New Delhi during 1998 The Workshop dwelled upon the issue of safety of disaster prone areas, imaginatively tapping of the unprecedented potential of modern science and technology and reducing the vulnerability of peoples in disaster prone areas by all possible means including the initiatives to remodel Mega and Metropolitan cities now under the shadow of natural disasters.

The eighteenth event i.e. **Sustainability Strategy for Promoting Export Competitiveness in Knitwear Industry** was organized at Thirupur. The main objective of this workshop was to bring together a cluster of textile and garments exporters to address their needs and requirement in meeting international standards and bringing about a synergy between social, economic and environmental performance. The workshop also focused on raising awareness of social and environmental issues in the supply chain highlighting' the benefits of sustainable production methods, profiling existing tools to improve performance, outlining elements of a sustainable production strategy and identifying local training needs for future programmes.

Aside of the Workshops, compilations on India's Trainer potential was brought out and distributed widely for the benefit of the users in the developing countries as a further boost to TCDC activity.

5.6.2. Trainer Potential of CSIR Laboratories and Other Institutions in India

The very rich experience of CSIR in carrying out capacity building initiatives under the umbrella project yielded as an important byproduct, a compendium of the available infrastructure and expertise in specialized areas of S&T in the CSIR laboratories. It caught special attention of the developing countries during the four TCDC workshops, as it projected the level of available Indian capacity. This led to the compilation of a comprehensive publication on the training facilities for India as a whole, covering CSIR as well as non-CSIR institutions, such as Department of Electronics, IITs (Mumbai, Kharagpur, Kanpur), and R&D Centres in industries. As decided by the Programme Policy Committee at its meeting held in September 1998, more than 700 copies of the 'Trainer Potential' were distributed, along with CD-ROM to the Indian missions in the developing countries, missions of the developing countries in India and also through APCTT and UNDP networks for wider dissemination.

5.6.3. Technological Needs for Small & Medium Enterprises in Developing Countries

In the changing global market environment, small and medium enterprises (SMEs) in developing countries face a new challenge. It was considered appropriate to strengthen the SMEs sector in Manufacturing Industries through GOI-UNDP Umbrella Programme by launching a study to identify the technology needs of small and medium enterprises in India in following sectors: Drugs and Pharmaceuticals Sector, Building material Sector, Food Processing Sector and Leather Industries Sector

A Brainstorming session was organized at Committee on Science & Technology in Developing Countries at COSTED in Chennai during June 1 – 2, 1998. As a follow-up, two more meetings were held and studies were

carried out in four sectors i.e. (i) leather, (ii) food, (iii) building materials and (iv) drugs & pharmaceuticals to find out the problems being faced by the SMEs and the technological and other inputs that could be made available. Reports from the coordinating agencies are given in Appendix: 8.

A brainstorming meeting session of the coordinators of above mentioned four sub-sectors, government representatives and other agencies was also organized with a view to make policy recommendations and consider if some more studies are required to fine tune the recommendations.

5.6.4. Participation of Indian Industries in the TOKTEN Programme

The Joint Evaluation Mission appointed by the Government of India and UNDP to review the progress of TOKTEN Programme in India in June 1994 recommended in its report that there was an urgent need to shift the focus of new phase i.e. the Umbrella Project, from basic research to industrial applications. This provided stimulus to participation by Indian Industry in virtually every thematic workshop, (Figure 4.) The list of industries, which directly benefited from the programme, is presented in Appendix 9. With reference to (Figure 2), about 240 industries participated in the events including small & medium enterprises (SMEs). Highest number of response (78) was for the Brain Storming arranged for the SMEs in Developing Countries which drew special attention to the problems of technological obsolescence, finance etc. faced by the SMEs. Other sought after areas by the industries were Knitwear industry (35 participants), Drugs & Pharmaceuticals (24) and Leather Sector (10).

The participation of Indian Industries was not limited to international workshops. A large number of Industries came forward to avail the services of experts under TOKTEN and UNISTAR streams of GOI-UNDP Umbrella Programme, as listed in Appendix 9. Thus the Umbrella Project gave timely and much needed stimulus to the industries.

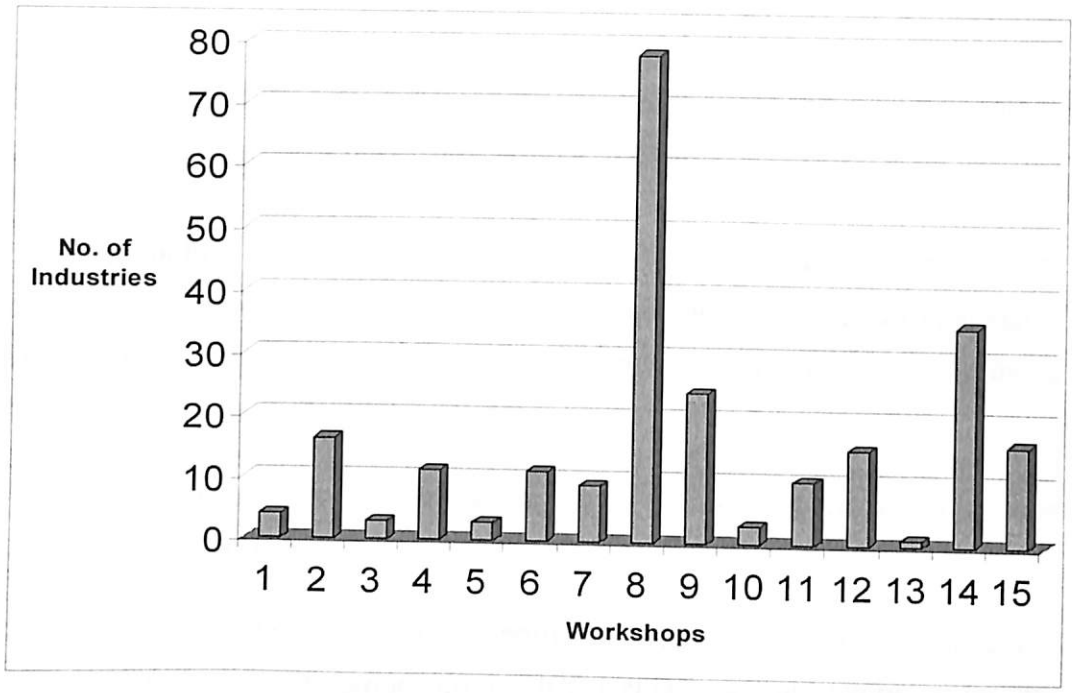

Figure 4: Participation of Industries in the International TCDC Workshops

5.6.5. Consortia approach

Further, CSIR could mobilize lateral support from outside agencies like APCTT, COSTED, NAM Centre for S&T, Universities, IITs, DST and DBT resulting in cost effective implementation of the Umbrella Project. Besides enriching the substance of the workshops, it also resulted in off-loading of operational costs from the project fund. The proactive involvement of industry, academic institutions and R&D organizations, all spotlighting a single theme, added substantial sheen to the Workshops. In the TCDC Workshop on 'Natural Disaster Reduction: Policy Issues and Strategies', for example, the association of APCTT facilitated participation of an additional twenty seven experts and participation from as many as thirteen developing countries, off-loading the international travel and part printing costs to APCTT. Tapping of resources from the DST helped partially support participants from developing countries like Sri Lanka.

In the International workshop on Herbal Drugs, besides the continued participation of APCTT, the event took advantage of the bilateral partners of CSIR by diverting the international travel cost of the respective participants to the foreign partner and cost of stay in India to CSIR.

It is obvious that when the costs are off-loaded to other partners, much more could be achieved within the allocated budget, by deploying the savings to service other activities. Further, the lateral financial inputs helped in improving the scale and scope of project delivery.

The value-addition to the Umbrella Project by the international organizations is revealed by the following examples.

- Training workshop on Quality Control of Medicinal Aromatic Plants and their Products was organized by ICS-UNIDO, as an event under the institutionalization of Herbal Drugs activity, in which scientists from nine Asian countries participated and about 17 aspects were covered during 2-6, November, 2004 at the India International Centre, New Delhi in which all the resource persons were provided by India.

- APCTT organized a workshop on Herbal Drugs in Nepal during October 7-9, 1998 in which all the resource persons were provided by India and APCTT and GOI-UNDP Umbrella Project did funding jointly.

5.6.6. Processes Developed through Umbrella Project

Some of the processes/technologies developed under the Umbrella Project are:

- Development of silicon carbon components for making seals
- Drying technology for food processing
- Waste water treatment process with no sludge
- Polymer laser and amplifier
- Activated carbons
- High throughput screening for active compound from natural products.

5.6.7. Glimpses of major contributions under the Umbrella Project as revealed by host organizations

The outcome of interactions with the experts under the Umbrella Project, based on the reports submitted by the consultants, host organizations and the National Project Coordinator, for the period 1996-2001, is as follows [CSIR, 1997; CSIR, 1999; CSIR, 1997; CSIR, 2000; CSIR, 1997]:

5.6.7.1. R&D Institutions

- The National Project Coordinator has reported that a new project on "Development of improved techniques/methodologies for repair/strengthening of concrete structures" was initiated at the Structural Engineering Research Centre (SERC), Chennai, which involved development of high performance concrete materials and their applications for repair and rehabilitation of concrete structures [CSIR, 1997].

  - An interesting application was in developing the design of bubble type dome units in high performance concrete for the Parliamentary Library Building at New Delhi.

  - A project on "Development of high performance concrete and its application to precast products" was continued and involved analysis of different kinds of mixes for high performance concrete, making use of flyash, silica fume, ground granulated blast furnace slag and other chemical admixtures. Rich experience and knowledge was obtained as a result of this project.

  - Carried out a consultancy project on "Design of concrete mixes using cement containing high volume blast furnace slag for the construction of break-water for Coal Port" at Ennore (near Chennai), based on the expertise developed in this area.

- A memorandum of understanding was signed between RRL-Jammu and Syrian Scientific Research Centre (SSRC), Syria, for training of Syrian scientists and technicians in the areas of Fermentation, Medicinal Plants and Biotechnology at Jammu.

- At the Centre for Cellular and Molecular Biology (CCMB), Hyderabad, agreement were made with Dr Suraj P. Bhat, Associate Professor, Jules Stein Eye Institute, California, USA, to provide recombinant , α- Crystalline producing expression systems. Additionally, Molecular Biology Research Units were set up at L V Prasad Eye Institute, Hyderabad.

- The visit of Dr M M Sayeed, Professor of Physiology, Loyola University Medical Centre, Illinois, USA, was beneficial in understanding the post-burn diseases and also yielded research collaborations, e.g. at the Patel Chest Institute, Delhi, a new project, "To assess the pathophysiological implications of the activation of the pulmonary J. receptors" was agreed to be initiated as a joint-venture.

  Some research collaborations were also proposed by late Dr Sayeed with CDRI, Lucknow, Institute of Microbial Technology (IMT), Chandigarh and CBT, Delhi.

- Dr Rajendra K. Sharma, Professor Department of Pathology, University of Saskatchewan, Canada, visited M/s Panacea Biotech, Chandigarh; Jamia Hamdard University, New Delhi; AIIMS, New Delhi and emphasized that the biochemical mechanisms of various diseases in following fields may be studied:

  - N-myrestoyl transverse as a marker for diagnosis and prognosis of colon cancer
  - The role of specific ealmodulic-dependent cyclic nucleotide phosphodiesterase in cardiovascular diseases, stroke brain tumours and in Parkinson's disease

- For rapid primary screening of anti-TB drugs, target-based screening projects in malaria, Dr Kaveri Venkatesh from the Immuno-Pathologies Humaine, Hospital Broussais, France, opted for developing molecular reporter-based assays at CDRI, Lucknow.

  - Dr Kaveri, provided guidelines regarding initiation of High Throughput Screening (HTS) of newly synthesized molecules and National Product Libraries, particularly in the area of biochemical targets, molecular immunology, antifungal targets, myeobacterial diseases and pharmacology, at CDRI, Lucknow. The visit helped in starting semiautomated medium throughput screening system and also developing suitable assays. Development of HTS was also discussed with IICB. Dr Kaveri encouraged HTS collaboration between the Indian labs. He further discussed about the various aspects of Leishmania research, e.g. immunologica, donovani, etc. at IICB, Kolkatta.

  - After studying the research work at the Centre for Biochemical Technology (CBT), Delhi; Jawahar Lal Nehru Centre for Advanced Research, Indian Institute of Science (IISc); Bangalore and Indian Institute of Chemical Biology (IICB), Kolkata, Dr Kaveri indicated that labs working in the area of drug discovery and drug design should gear up for switching to HTS system. Further he suggested adding new assays, to adapt to changing nature of R&D, to create compound libraries, to automate existing screening assays and to define new *in vitro* screens.

- Professor R D Tyagi, Quebec, delivered a lecture on "Industrial waste water treatment" and emphasized on microbial utilization of treated sewage for the production of useful products, at CDRI, Lucknow.

- Professor Tapan K Sarkar, Department of Electrical and Computer Engineering, Syracuse University, USA, demonstrated at the Indian Space Research Organisation (ISRO), Ahmedabad the Software packages brought by him. Following topics were discussed.

- Multi-functional antennas and electromagnetic software for analysis of different types of antennas
- EMI/EMC related issues developed for use in satellite communication payloads as well as ground hardware
- SAC requirement on software development for mux and demux filters.

➢ Dr G. N. Pandey from the Psychiatric Institute, USA, addressed the participants in TCDC Workshop on "Herbal Drugs" at RRL, Jammu under TOKTEN and gave a seminar on "Serotonergic Mechanism in Anxiety and Suicide". He interacted with young scientists engaged in platelet receptor studies and discussed his current studies with them on human post-mortem brain samples in suicidal and non-suicidal cases and presented some exciting data. He also gave valuable suggestions for drawing experimental protocols for platelet serotonergic receptor subtypes in human samples.

➢ Professor Satu M Somani of Southern Illinois University, USA, participated in TCDC workshop on "Herbal Drugs" and discussed about the activity profile of two already identified active fractions, being extensively used in the Ayurvedic System, from the two different plants. On the suggestion of Dr Somani the two fractions were tested against Cisplatin, a drug currently being used in Cancer Chemotherapy. He made a presentation entitled "Modulation of Antioxidant System from Plant Products and Drugs". A collaborative study entitled "Antioxidants and their Modulation by Indian Herbals" was also initiated. The kits and chemicals for the study were provided by Prof. Somani.

➢ Dr Som R Soni, USA, delivered lectures on the `Aerospace and Non-aerospace Applications of Composites', at IISc, ISRO and ADA. He installed `Automated System for Composite Analysis Code' in a PC and demonstrated its specific uses. A collaborative R&D project for the understanding of response characteristics of composites under Thermochemical Multi-axial Loading Conditions was formulated. The

technical aspects of an Indo-US collaborative research project "Life Prediction Methodology for PMC Joints and Components" were also discussed.

- The outcome of the visit of Dr M. S. Chorghade of Abbott Laboratories, USA to NCL, was as follows:
  - Setting up of a NCL-GLP Lab was discussed.
  - Two short-term training courses on GLP were conducted for quality upgradation.
  - Standing operating procedures being followed by NCL scientists were modified.

- Dr M. K. Mishra, USA, made a presentation on "Additives for Petroleum using Macromolecular Engineering" at NCL and provided valuable inputs to the ongoing research in the areas of: (a) Controlled Polymer Synthesis, and (b) Synthesis of Polymers using Metallocene Catalysts. Based on the on-going research work at NCL:
  - Use of Metallocene-based catalysts for the preparation of novel and more efficient ashless dispersants and PPD was spelt out, and
  - A proposal based on branched multiblock styrene-isoprene copolymers and VI improvers was worked out.

- Dr S. Venkatesan of Ovonic Battery Company, USA visited BHU, Varanasi to participate in a TCDC workshop on "Hydrogen Energy and Related Technologies" and provided information on "Nickel Metal Hydride Batteries and Fuel Cell Technologies" in particular for hybrid vehicles. A joint project on Hybrid electrical vehicles was envisaged with BHU. Dr S. Venkatesan had discussions on the projects on solar and wind energy in the Saha Industrial Research Institute, Varanasi.

  Dr Venkatesan also visited the SPIC Science Foundation, Centre for Electrochemical and Energy Research (CEER), Chennai and delivered a lecture on "Metal Hydride Battery Development and presented the recent progress made at Ovonic Battery Co."

- Dr Ashok K Vijh, Institute of Research, Canada, suggested to create a separate Division for research on `conducting polymers' at Central Electrochemical Research Institute (CECRI), Karaikudi, for enhancing the work towards organics and synthetic aspects, to conduct research in electrochemicals.

- Dr Sunil Dutta, in collaboration with Central Glass and Ceramic Research Institute (CGCRI), Carborandum Universal Ltd (CUL), expressed interest in product development work. Consequently, a collaborative and cost-sharing technology development programme for manufacturing of silicon carbide components for use in mechanical seals was firmed up.

- Professor Suresh K Bhargava, Director, Department of Applied Chemistry, Royal Melbourne Institute of Technology, Australia, interacted with the University Department of Chemical Technology (UDCT), Mumbai, for working in the field of environment management. He also offered a post-doctoral assignment to a Ph.D. scholar at RMIT in Australia.

- Discussions were held on a number of compounds/chemicals being tested in the Department of Pharmacology, Central Drug Research Institute (CDRI), Lucknow for its potential cardio-protective effects. Further, new experiments for a quick screening were proposed and Dr Pawan K. Singal, Professor, Institute of Cardiovascular Sciences, University of Manitoba, Canada, made available the detailed procedure. Arrangements were made for transferring technology from Dr Singal's lab to Department of Pharmacology, AIIMS for establishing a small animal model of heart failure for testing new indigenous drugs for their efficacy in the treatment modulation of heart failure. Exchange of visits of qualified personnel between the two laboratories was also planned.

A joint project with Post Graduate Institute of Medical and Education Research (PGIMER) to undertake clinical trial for testing the efficacy of adriamycin and protocol in the treatment of cardiac cancers was identified.

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- Dr Lakshmi of Andhra Medical College, Vishakhapatnam under ECFMG International Fellowship of USA.
- Dr T. Asha of Guntur Medical College for one year.
- Dr (Mrs) Usha Singhal received training under ECFMG International Fellowship.

➢ Dr Munmaya K. Mishra of Texaco R&D Department, USA, visited Ravenshaw College, Orrisa and highlighted the modification on motor oil by making use of polymers to maintain viscosity and minimize friction. Besides, two courses were also presented on "Polymer science".

5.6.7.3. Industries

➢ As an outcome of the international Workshop on Surface Engineering and Coatings, following five major important projects attracted the attention of the industries:

- Development of dry and lubricant coating for high speed dry machining of abrasive light weight aircraft materials such as aluminium silicon alloy, magnesium alloy and fibre composites
- Development of electrocomposites coating for triobological applications
- Development of corrosion-resistant coatings, composite-gradient coatings, and multi-layer coatings for specialized applications
- Diamond-like coatings and diamond coatings for improving the life of cutting tools
- Pre-treatments of interface coating on the cemented carbide cutting tools and improving bond of the crystalline diamond coating

➢ The setting up of a Microbiological Research Lab. at Medicity Medical Centre, Hyderabad was planned during the visit of Dr Sayeed of USA. This is to study pathophysiological mechanism of sepsis. A research proposal on "The investigation of the role of endothelia and GCDS in the pathophysiology of gram-negative infection" was also formulated.

- Coal India, being a primary energy source, produces about 70 MMT CCBs in a year. About 95% CCBs remains unutilized and pose a big national problem. Dr Yoginder P. Chugh, Professor and Chairman, Department of Mining Engineering, Southern Illinois University, Carrbondale, Illinois made several recommendations for better management of CCBs in India.

- Prof. Rudi Paul Labadie, University of Ultrecht, The Netherlands, discussed various standardization techniques and clinical studies of herbal products produced at Dabur Research Foundation, Sahibabad. He also gave presentation on evaluation of certain herbal products for their immunomodulatory activity.

- Dr Venkatesh Shankar, University of Maryland, participated in a Seminar on South-East Asian Economic Crises: Opportunities and Challenges for Indian Exporters organized by the Federation of Indian Export Organizations at Chennai and Bangalore. The impact of South-East Asian economic crises on international trade and commerce, the implications of the crisis for India, in particular and international marketing strategies for Indian exporters were discussed.

- Dr Munmaya K Mishra, Texaco R&D Department, USA, visited the Indian Oil Corporation Ltd, Faridabad and discussed about R&D collaboration on development of polymeric petroleum additives.

- Dr M. R. Ramsay, Advanced Productivity and Quality Centre for Australia interacted with a select gathering of entrepreneurs of Karnataka Small Scale Industries Association (KASSIA), Bangalore on Enterprise Productivity Measurement. The factors influencing productivity and the concept of factor productivity and total productivity covering the Rahmods Productivity – Measurement, Budgeting, Total Economic Mounting and Control System were explained. The programme gave stimulus to hard thinking on the productivity aspects by the small scale industries.

- Dr Ramsay also arranged a Workshop on "Enterprise Productivity Measurement" at the National Thermal Power Corporation Ltd. (NTPC), New Delhi. Presentations on (a) RAPMOD System (b) Enterprise Productivity Measurement were delivered to about 30 senior level executives of NTPC and following presentations were made:

  Consequently, a new model of `Productivity measurement' for NTPC's projects was developed and a new insight about `Productivity' emerged.

- Professor Tapan K. Sarkar, Syracuse University, USA, delivered the following lectures at the Society for Applied Microwave Electronics Engineering and Research (SAMEER), Mumbai:

  - Analysis of RCS and antenna using numerical technique
  - Millimeter wave and Sir J C Bose
  - Hilbert transform and its application

Prof. Sarkar provided the latest knowledge about technological development in the field of antenna and numerical techniques. The obstacle response consisting of conducting pattern on dielectric in w-band waveguide was computed employing the numerical technique developed by Prof. Sarkar.

- The productivity of M/s Co-Nick Alloys, Mumbai, increased significantly by the utilization of the improved technology proposed by Dr Sudhir K. Sharma, Union Carbide Industrial Gases Inc., the USA, for the production of cobalt super alloys, stainless steel and other related products.

Chapter 6

Institutionalization of TOKTEN

A major achievement of the Umbrella Project was the sustenance of at least two of its major activities by design. Herbal Drugs and Natural Disaster Mitigation were picked up after a very careful consideration of competing areas. Herbal drugs were already capturing global attention because of the unprecedented business potential. And India is doubtless a major player. Similarly, Natural Disasters got flagged as an area of highest national importance requiring almost continuous attention. Both areas were receiving inadequate attention in a fragmented manner and were lacking nations focus. India had the expertise and infrastructure to meet the challenge.

CSIR Institutions like Regional Research Laboratory, Jammu, Central Drug Research Institute, Lucknow and National Botanical Research Laboratory, Lucknow, and at least ten other laboratories in India were deploying more than 500 scientists to address every aspect of Herbal Drugs. But we could merely touch the tip of the iceberg of our potential. Our infrastructure was such that under one roof we could carry out extraction, isolation, purification, structural elucidation, new molecule design, chemical synthesis, process development, pharmacology and micro-biology and toxicology. And yet we were way behind the state of the art technologies and processes. It was therefore nearly a unanimous decision to so design the activities in this area under the Umbrella Project that the activity becomes sustainable.

The second area, namely, Natural Disaster Mitigation could marshal much wider support for institutionalization. Frequent recurrences of earthquakes, cyclones, floods, drought and landslides were already a big drain to national economy, besides being an increasing threat to life and property. Here again the activity lacked specific focus because institutional responses were fragmented and inadequate.

6.1. Institutionalization of Herbal Drug Activity

6.1.1. Background to Institutionalization

The herbal drug activity has always been a thrust area under the TCDC Stream of GOI-UNDP Umbrella Project. A TCDC International Workshop on Herbal Drugs was organized at RRL, Jammu during September 18-22 under the aegis of GOI-UNDP Umbrella Project. Many developing countries such as China, Turkey, Sri Lanka, South Africa, Vietnam, Thailand, Syria, Kuwait, Nepal etc. participated in the workshop. The workshop was a great success.

As a follow-up action of this TCDC initiative, ICS-UNIDO in collaboration with RRL, Jammu and the project team organized another training workshop on Quality Control of Medicinal and Aromatic Plants and their products from June 15-20, 1998 at RRL, Jammu. Participants from eight Asian countries viz. Sri Lanka, Bangladesh, Vientiane (Lao PDR), Thailand, Malaysia, Mongolia, Nepal and Philippines were provided training in the latest techniques in the area of herbal drugs. A training manual on herbal drugs was also brought out on this occasion.

Another follow-up action was an initiative of holding TCDC Workshop on Herbal Drugs at Kathmandu in Nepal during October 7-9, 1998 and at Tehran from November 14-17, 1999 jointly with Asian and Pacific Centre for Transfer of Technology (APCTT).

As illustrated above, a lot of work was done under the GOI-UNDP Umbrella Project in promoting the cause of herbal drugs and medicinal and aromatic plants in India and other developing countries. This also helped in fostering and promoting cooperation amongst the participating developing countries and addressing their training needs in this area.

6.1.2. Untapped Potential

The annual value of medicinal plants derived from developing countries is nearly US $50 billion. Resurgence of interest in herbal drugs in the Western and European countries has truly enhanced the consumption of medicinal

plants many fold. Estimates of the World Bank Report 1996 has put the figure of world trade in medicinal plants and related products at US $ five trillion by 2050 A.D. Many developing countries share the common asset of varied and abundant resources of medicinal plants. Ethnobotanical, ethnomedical practices, and recently derived scientific knowledge have focused attention on the possibilities of utilizing this natural flora towards developing valuable pharmaceuticals and processed industrial products. In order to realize this, effective technologies that are currently available in the developed and some developing countries and proper quality control procedures have to be adopted. One of the major constraints that have impeded development of products that can be competitive in the world market is the poor quality of the herbal products and the lack of good manufacturing practices. Many of the countries do not ever have their own Herbal Pharmacopoeia thus not maintaining or regulating even bare minimum standards of medicinal plant products with in their own countries.

6.1.3. Major Gap Areas

Major gap areas in herbal drug production in developing countries can be listed as follows:

- Non-existence of standardization and quality control parameters for the raw material as well as for the finished products.
- Lack of available of safety and efficacy evaluation data, which could be generated in much shorter period and at a much lesser cost as compared to modern drugs.
- Though World Health Organization has laid down standards for medicinal plants but each country needs to have its own Herbal Pharmacopoeia for regulating and maintaining quality of herbal drugs.
- There is a dire necessity to disseminate information on various methods for documenting ethnomedical knowledge of herbal drugs in each developing country otherwise such knowledge will get lost with the passage of time. By documenting the traditional and folklore knowledge in herbal drugs the concerned country can protect ones cultural heritage and intellectual property rights.
- Development of agro technology and post harvest technology of medicinal plants to endure sustainable use of quality raw material for

herbal drug production. This will promote cultivation of medicinal plants and reduce dependence on wild sources of raw material. There has been indiscriminate removal of medicinal plants from natural sources leading to loss of germ plasma and biodiversity of developing nations. Around 95% of the medicinal plants used by the herbal drug in developing countries at present are collected from wild sources. Less than 20 species of plants are under commercial cultivation while over 4000 species are used in production of herbal drugs. Over 70% of medicinal plant collections involve destructive harvesting because of the use of plant parts like roots, bark, wood, stem and the whole plant (in case of herbs). This poses a definite threat to biodiversity of medicinal plants.

- There are 25 million species of plants, identified on worldwide basis for their medicinal value, out of which only 20,000 plants have been documented and only 5,000 of them have been phytochemically studied. Thus there is big gap to be filled by promoting activities on phytochemical and pharmacological studies of herbal drugs.

- Networking for information on various facets of herbal drugs among developing countries has become a great necessity for understanding each country's strengths and weaknesses in the field of herbal drugs and then to evolve a programme of reciprocative benefits.

- There is a need to rigorously pursue the activities on medicinal plants with a national focus. To prepare a national policy and a strategy for medicinal plants which would address the need for inventorization, conservation and cultivation of medicinal plants and to provide for long term availability of the planting material.

- Each country needs to have national inventory on medicinal plants and this should be a primary step towards documentation of the medicinal plant resources.

- There is a need for national regulation for protection of medicinal plant resources being over-exploited.

- Every developing country needs to preserve and maintain knowledge, innovations and practices of indigenous and local communities using herbal drugs.

- Need to have information on market requirements for the next decade with need based production planning and proper marketing strategies for buy-back arrangements.

- Human Resource Development by organizing training programmes on agropractices, post-harvest technology, processing technology, quality control and standardization techniques development of Pharmacopoeial standards, IPR Issues, Validation of Claims of efficacy and safety of herbal drugs, value addition and marketing trends.

- Special emphasis on R&D work on development of agrotechnology, genetic improvement, technology for bulk drug production of medicinal plant products development of quality control standards, search for new plant sources for known drugs and for new drugs from locally available plants. Priorities may be given to plants having antimaterial, antifilarial, antiarthritic, antirhematic, immunomodulators, adapogens, anti hepatotoxic, wound healing, memory enhancing, antidiabetics, sedatives etc.

- Development of nutraceuticals/health food supplements and herbal cosmetics.

Institutionalization of the activity would evidently ensure sustainability of effort on a topic of great national interest.

6.1.4. Initial Aims of Institutionalization

In order to accelerate the process of cooperation among developing countries in the area of herbal drugs, the GOI-UNDP Umbrella Project has taken the step to institutionalize this activity at RRL, Jammu with following objectives:

- To periodically hold workshop and training programs in the area of herbal drugs so as to promote cooperation among developing countries not only to take stock of the herbs and medicinal plants wealth of the region but to harness this resource in fruitful manner.

- Preparation of database on herbal drugs and to establish connectivity with other databases within and out side the country, so that institutionalized activity can serve as a National clearing house of information on herbal drugs.

- To bring the developing countries on the network and prepare ground for holding e-conferences on herbal drugs regularly in cyber space.

- To prepare pharmacopoeia monographs.

- To encourage collaborative R&D activities among developing countries in the area of herbal drugs.

6.1.5. Scope of Coverage in the Formative Stage

- To prepare database on herbal drugs and to establish connectivity with other databases, within and out side the country, with the aim to serve as a National Clearing House of Information on herbal drugs.
- To bring the developing countries on the Network and prepare ground for holding e-conferences on herbal drugs in cyber space.
- To prepare Pharmacopoeia monographs of selected medicinal plants.
- To periodically hold training workshops in the area of Herbal Drugs with a view to take stock of the wealth of herbs and medicinal plant in the region and to harness this resource in fruitful manner.
- To promote cooperation among developing countries.

6.1.6. Parking of Herbal Drug Activity

The selection of RRL-Jammu was because of its national and international reputation in the area of herbal drugs and the overall mandate of the laboratory covering all the aspects envisaged under the network activity. The institute has the necessary infrastructure and S&T manpower on all the aspects, from development of agro-technologies to the production of finished value-added plant products. Besides, RRL, Jammu was instrumental in organizing two more workshops on herbals in Nepal and Tehran under the UNDP Umbrella Project.

A Brain Storming Workshop was held at RRL, Jammu on 1-2 October, 2000 to discuss the concept paper for the institutionalization of this activity. Twenty-two distinguished participants, with international standing in the fields of medicinal plants, IPR & its management and bioinformatics as well as Phyto-pharmaceutical industry took part in the deliberations [Regional Research Laboratory]. Based on their recommendations a Knowledge Network on

Medicinal Plants and National Centre for Training & Technology Transfer has been established at the Regional Research Laboratory Jammu as an extension of GOI-UNDP Umbrella Project.

6.1.7. Steps taken by the Anchor Institution

Following initiatives were taken by RRL, Jammu for the institutionalization of Herbal Drug activity.

- An exclusive task force was created in the RRL, under the direct control of its Director.
- The necessary hardware and software were procured from the project funds.
- Steps were initiated to establish networking with other institutes, both within India and abroad.
- After a brain storming session involving experts in herbal drugs, from India and other developing nations, a calendar of activities was released for the period 2001-2003, which was strictly adhered to. Efforts were made to enlarge the scope of activities as an outcome of the deliberations of the proposed brain storming meeting on the proposal.

6.1.7.1. Long-term Plan

The long-range initiatives aimed at:

- A national policy and strategy for medicinal plants that would address the need for their inventorization, conservation and cultivation and provision for long-term availability of the planting material.
- A national regulation for protection of medicinal plant resources from over exploitation.
- Development of sustainable harvesting techniques and training there of.
- Preservation and maintenance of ethnomedical and traditional knowledge, innovations and practices of indigenous and local communities using plant- based drugs in order to protect IPRs.

- Systematic study of national and international market demand of herbal drugs.
- Encouragement of agro-based phytochemical and pharmaceutical industries to manufacture and export value-added products, instead of crude medicinal plants.
- Development of new economical, agro-technological packages under different ecological conditions and information on inter-cropping and use of biofertilizers, biopesticides, biocontrol agents and organic farming etc.
- Improvement of quality through genetic upgradation and selection of medicinal and aromatic plants.
- Large scale availability of high quality planting material by developing a network of nurseries of medicinal plants.
- Information/data generation on requirement of herbal drugs during the next decade with need-based production and planning.
- Networking of individuals and institutions within the country and outside engaged in the activities related to herbal drugs.
- Preparation of the database on herbal drugs and exchange of information within the institutions of India and the developing countries.
- Preparation of database on Herbal Drug patents, technologies available in different countries and herbal drug industry in the country and in developing countries.
- Preparation of a database on chemical, protein and DNA markers of the plants used as herbal drugs.

6.1.8. Mobilization of Support Resources

This activity was launched initially with the seed money of US $ 29000 under the GOI-UNDP Umbrella Project. A project proposal entitled 'Knowledge Network on Medicinal Plants' covering one of the major components of this activity was submitted to ICMR (US $59108) to supplement resources and develop a database on the 50 most important medicinal plants of India. Besides above, RRL, Jammu enjoys support from different national bodies to undertake research work and to organize training programmes, which fall under the ambit of the Herbal drug activity.

It is expected that the activity will not only be self supporting but will grow in ten years time.

6.1.9. Preparatory Ground Work

6.1.9.1. Infrastructure development

- Necessary office space/database development Center and a Conference Hall has been exclusively earmarked for this activity.
- Necessary hardware in the form of Computer systems, Digital Camera and Projection aids have been procured.

6.1.9.2. Workshops/ training courses organized

- A database driven website http://www.herbalnet.org was launched on 30th June 2001 [Regional Research Laboratory, 2001].
- A training workshop for master trainers on Aromatic Herbal Farming under 'Maa Shakti' Project was organized during May 20-25, 2002 in which 20 Master Trainers were imparted training, through lectures and field demonstrations.
- A two days' National Workshop was organized on 'Intellectual Property of Herbs and Horticulture' during September 26 to 28, 2002 at RRL, Jammu. It was attended by 67 delegates from all over the country.
- Two days' Interactive Meet on Clarysage was organized at Ladhakh on September 6-7, 2003 for the benefit of officers of the agriculture / horticulture departments and local farmers. . The event was jointly organized with the Ladhakh Autonomous Hill Development Council, Leh.
- Under the activity, a "Brain storming session on Herbal Renaissance in J & K State- A window of Business Opportunities" organized on 23 -24 March, 2004 in collaboration with Entrepreneurs Development Institute, J&K State, Jammu. The meet was attended by NGO'S, industrialists and scientists. Based on the deliberations, recommendations for the promotion of herbal Industries in Jammu & Kashmir were finalized. The activity was coordinated by Dr. S. K. Bakshi, Scientist, Botanical Sciences.
- A five day Regional Training Course on the Herbal drug Industry for compliance to quality parameters was organized from 2-6 November, 2004 at India International Center, New Delhi. The training course was jointly organized by the International Centre for Science and High Technology and the United Nations Industrial Development Organization (ICS-UNIDO), Trieste, Italy and the RRL, Jammu.

The workshop was an endeavor to help Small and Medium Enterprises (SMEs), involved in the manufacture of herbal drugs in India and other neighbouring countries, to acquire knowledge, skill and information for improving their product compliance to the quality parameters.

Faculty of the Training Course included, eminent national and international scientists and experts from industries, R & D Institutions and Centres of Excellence within India and abroad. Part of training course was devoted to visit to a Good Manufacturing Practice (GMP) compliance herbal drug Industry. The training was imparted to 40 participants from India, Nepal, Sri Lanka, Bhutan and Bangladesh on the following major areas.

- Traditional knowledge in development of modern medicine
- Industrial innovations in manufacturing of plant-based medicine
- Isolation techniques for markers for in-house standardization of plant products Ayurvedic plant products for expanding global market
- Quality control of plant products
- Important aspects of Ayurvedic formulations and scope of integrating traditional knowledge with technological advancements
- Importance of microscopic, physical and chemical analysis of plant drug Industry-institute partnership for improving quality compliance
- Applications of pharmaceutical technologies in manufacturing herbal medicine
- Learning sessions for microscopic, phytochemical, Thin Layer Chromatography (TLC), High Performance Thin Layer Chromatography (HPLC) and Gas Liquid Chromatography (GLC) applications
- Standard Operating Procedures (SOP) of manufacturing of Ayurvedic products
- GMP for herbal drugs

6.1.9.3. Database on medicinal Plants

- Database on seven medicinal plants has been added on the site which is being enriched and updated from time to time.

- Database on additional five medicinal plants has been completed.

6.1.9.4. Development of Pharmacopoeial standards of ISM drugs

Under different studies sponsored by the Ministry of Health & Family Welfare, Govt. of India Pharmacopoeial standards for eight Arka's {*viz.* Pudina Arka (ex. *Mentha spicata*), Japanese Pudina Arka (ex. *Mentha arvensis*), Yavani Arka (*Trachyspermum ammi*), Satapusp Arka (ex. *Anethum sowa*), Ajmod arka (*Trachyspermum roxburghianum* (Dc.) (craib), Gulab arka (*Rosa damascena*), Jatamansi arka (*Nardostachys jatamansi*) and Saunf arka (*Foeniculum vulgare*)} and three important medicinal plants viz *Angelica glauca, Argyreia nervosa and Ferula jaeschkeana* based on physico-chemical parameters, TLC and GLC profiles with at least three marker compounds have been developed.

6.1.10. Networking with other Institutes

6.1.10.1. Global Biodiversity Information Facility

Work on the digitization of Janaki Ammal Herbarium has been initiated under the activity, using in-house developed software as a part of the development of India's Virtual Herbarium Network. For this activity RRL, Jammu has become "GBIF Data Provider Node" to the NBRI, Lucknow which is the National Node of the Global Biodiversity Information Facility (GBIF), an open ended International Coordinating body undertaking such activities at global level.

6.1.10.2. International Centre for Science & High Technology (ICS)

The Herbal network is a part of the Network on MAP'S Focal Points being co-coordinated by ICS-UNIDO, Triste, Italy .The aim of this network is to help the developing countries to synergize the utilization of their local resources of Medicinal & Aromatic plants. Presently in this network eight countries are participating. These are Chile, Costa Rica, Ethopia, India, Italy, Malaysia, Panama and Turkey. During the first year each of the partner countries have

prepared a database on the five commercially most important medicinal plants of their respective country. A meeting to review the progress of the network was held at ICS premises, Trieste, Italy on 5th October 2004. in the meeting it was decided to add more plants to this database and also to expand the focal point network to more countries. Further, the Key areas of information exchange were identified to strengthen the network.

6.1.10.3. Traditional Knowledge Digital Library (TKDL) – a CSIR Network Programme

The Herbal network is also participating in the CSIR Network project on TKDL which is being coordinated by the National Institute of Science Communication and Information Resources (NISCAIR).

6.1.11. International Symposium on Scientific Approaches to Quality, Safety and Efficacy Assessment of Botanical Products

The event was organized in collaboration with National Center for Natural Products Research, School of Pharmacy, University of Mississippi, USA during April 14–17, 2005 at the India Habitat Centre, New Delhi.

The symposium provided the Indian herbal drug/botanical supplement industry and other R & D institutes involved in research on botanicals to present their strengths / approaches in the research and manufacture of botanical drugs/ supplements to the visiting scientists from USA and Europe coming from various research / academic institutes, Industry and government regulatory authorities.

The aim was to help all the players in the trade of botanicals to understand consumer demands and quality parameters in International market and develop methods of production that meet those demands of product quality and efficacy, which either exceeds or corresponds to international standards. This would make these industries internationally competitive with greater share in the global market.

The speakers included experts from U.S. Food and Drug Administration, National Institute of Health, American Herbal Products Association and National Center for Natural Products Research, University of Mississippi besides scientists and experts from industries, R & D Institutions, academia, nonprofit institutions, regulatory authorities from India and abroad.. The topics deliberated during the symposium included:

- Collection, authentication, cultivation, harvesting and post harvesting handling and storage of medicinal plants.
- Private public participation for quality production of medicinal plants.
- Development of appropriate agricultural production systems for medicinal plants.
- Quality control of plant products using traditional & contemporary techniques.
- Extraction, isolation and identification of medicinal compound.
- Traditional knowledge & industrial innovations in manufacturing of plant-based medicines.
- Methods used in determining identity, purity, quality and strength of medicinal & aromatic plants.
- Isolation techniques for markers for standardization.
- The search for new bioactive compounds from higher plants and intellectual property rights.
- Bioevaluation and safety of botanical preparations.
- Validation of therapeutic claims of herbal drugs.
- Regulatory aspects of botanicals / nutraceuticals and herbal drugs
- Industry-institute partnership for improving quality compliance.
- Reverse pharmacology concept for clinical evaluation of herbals.

The institutionalization of Herbal Drug activity has thus helped India through RRL, Jammu in strengthening its crude drug repository and state-of-the-art museum of medicinal and aromatic plants. The institutionalization activity further facilitated development of RRL, Jammu as a National Repository for the purpose of certification for Herbal Drug Industry for authenticating the drug samples.

6.2. Institutionalization of Natural Disaster Mitigation Activity

6.2.1. Background to Institutionalization

The TOKTEN Umbrella Project delivered impressive outputs in the area of Natural Disaster Reduction. When the country faced the Malpa Rock Avalanche Disaster of August 1998, the project hosted (a) an international workshop on Landslide Hazard and Risk Assessment and Damage Control for Sustainable Development (b) a training program for the benefit of participants from developing countries and (c) field visits to the Doon valley to have an on the spot appraisal of the disastrous events.

Again, when the super cyclone of the century struck the coasts of Orissa in October/November 2000, yet another initiative was taken to host the Second International Workshop on Natural Disaster Reduction: Policy issues and strategies. Simultaneously with the workshop, a training program was also organized for the benefit of developing countries.

Both the above major events were attended by a large number of participants from the developing countries. The contributions made at the above two major events were documented and the findings were widely disseminated through the printed workshop proceedings.

TOKTEN Umbrella Project thus invested significantly in laying the foundation for providing policy guidelines and scientific & technological support to the task of Natural Disaster Mitigation. The project has also invested great deal in fostering and promoting cooperation amongst developing countries and in addressing their training needs under the TCDC component of GOI-UNDP Umbrella Project. It was therefore decided to institutionalize this activity at CRRI, New Delhi so that the momentum gained would help sustain the motion, beyond the life of the project.

6.2.2 Initial Aim of Institutionalization

The scope of work as envisioned is to spot light following three major functions.

- Provide periodicity to the TCDC Workshops/Training programmes in the area of Natural Disaster Reduction in order to continuously encourage and reinforce cooperation among developing countries especially towards Human Resource Development.
- Establish a database on Natural Disasters and endeavor to connect it with other national and international databases, so that the team to be established can serve as a national clearinghouse of information.
- Exploit the potential of information technology in encouraging dialogues in cyber space on topical issues connected with Natural Disasters and with the strengthening of the knowledge network.

6.2.3. Startup Initiatives

The Government of India took the initiative to appoint a High Powered Committee to address the multi-headed problem of natural disasters under the Chairmanship of Shri J. C. Pant, IAS. The concern about natural disasters got heightened with the ghastly tragedies inflicted by earthquake in Chamoli, rock-avalanche in Malpa and super-cyclone in Orissa [Bhandari, R K; 2001]. The UNDP-GOI Umbrella Project promptly responded to the national demand by hosting the following activities:

- An International Workshop on Landslide Hazard and Risk Assessment and Damage Control for Sustainable Development was organized during 6-11 November 1998. Also, a training programme for the benefit of the participants from the developing countries, and field visits to the Doon Valley to have an on-the-spot appraisal of the disastrous events, were arranged. The Central Road Research Institute (CRRI), New Delhi, a constituent laboratory of CSIR, coordinated this activity on behalf of the project.

- An International Workshop on Natural Disaster Reduction: Policy Issues and Strategies were organized during 21-22 December, 1999. Simultaneously with the Workshop, a training programme was also organized for the benefit of the developing countries. These events were coordinated by the SERC, Chennai, a constituent laboratory of the CSIR.

Both the above major events attracted multidisciplinary, multi-institutional participation from within the country and outside. The TOKTEN, the UNISTAR and the TCDC experts provided the resource inputs in both these cases. Additionally, a large number of delegates, especially from the developing countries attended the meetings and participated in training programmes.

The HPC of the Umbrella Project entrusted the responsibility of establishing a National Natural Disaster Knowledge Network to the National Project Coordinator and this initiative of the HPC triggered a set of activities, including establishment of the Knowledge Network. Encouraged by the HPC's recognition of the activity, the Programme Steering Committee of the Umbrella Project decided to institutionalize the activity in one of the National Centres of Excellence already associated with the Project. The choice of the Centre was to be such that spontaneous beginning could be made with a minimal of external support. The decision was hastened by the offer of Director, CRRI not only to park this national activity in the CRRI campus but also to provide a core team of scientists to man it. The choice was also supported on the consideration of merit because CRRI is the best known organization in the country for its expertise in the area of landslide studies and technical support. Yet another factor that facilitated decision-making was the global connectivity of the CRRI.

The above initiatives provided a great stimulus to the scientific and technological interventions in the task of Natural Disaster Reduction. The subject eventually appeared at the central stage when the Prime Minister of India in his Address at the Indian Science Congress, delivered on 3rd January 2000 in Pune, gave a national call to unite and fight the menace of Natural Disasters. The Prime Minister's proclamation was quickly put to action by the

government, and a High Power Committee on Natural Disasters got established.

The NPC of the Umbrella Project was invited by the HPC to (a) provide an overview on Natural Disasters in India, and (b) frame out a proposal on Natural Disaster Knowledge Network. The proposal was accepted by the HPC and the task of establishing a national natural disaster knowledge network, which was essentially a user-friendly network of networks, took root at CRRI, under the direction of the NPC.

6.2.4. Scope of Coverage

Many landslides in India as also elsewhere in the World have turned out to be worst tragedies leaving behind a trail of deaths and devastation. The declaration of International Decade of Natural Disaster Reduction by the UN General Assembly is therefore, to be appreciated and recognized as a major stimulus and motivator of global initiatives. The sharing of national, regional and global experience and pooling of resources are more essential today than ever before.

- India should quickly move on to global information network to be able to correlate its problems and rich experiences on landslide hazards, with those occurring in the other parts of the world.

- There are number of agencies in India dealing with the multi-faceted aspects of natural disasters. They are working mostly in isolation independent of one another, addressing certain specific facets of the problems in a limited sense. There is an urgent need to galvanize all these efforts by creating a National Apex Committee. Some illustrations of the spread of this activity is given below.

6.2.4.1. Landslide Disasters

- Earthquake induced Landslides –Geophysical Studies Investigations, Instrumentation and Monitoring (NGRI)
- Landslide Investigations & Remediation, Design of Buildings on Problematic Slope and Hazard Mapping (CBRI)
- Landslide Investigations & Remediation, Instrumentation and Forecasting (CRRI)
- Slope failure in Open Cast Mines, Cuttings, Colliery Tips, Mining Spoil Dumps, etc. (CMRI)
- Environmental Impact Assessment and Rejuvenation of Degraded Slopes (NEERI)
- Mathematical Modelling of landslides and other Mass Movements (C-MMACS)

6.2.4.2. Floods

- Design of Roads and Embankments in Flood Prone Areas; Flood induced Landslides and remediation (CRRI)
- Flood induced Landslides and Flood Resistant Structures (CBRI)
- Cyclonic Floods and Flood resistant structure including shelters (SERC)
- Environmental Impact Assessment of Flood prone and flood frequented areas (NEERI)
- Mapping of water quality, Potable Drinking Water Supply by water purification in contaminated lands (ITRC, NCL, CSMCRI, RRL(B))
- Post Flood disaster epidemics (IICB, CDRI)
- Mathematical Modelling of Floods (C-MMACS)

6.2.4.3. Droughts

- Mapping of Ground Water by Remote Sensing (NGRI)
- Climate change, El Nino. La Nino effects (NPL, NIO)
- Presentation of Biodiversity in the Drought prone Areas (NBRI)
- Mathematical Modeling and Forecasting of Monsoons (C-MMACS)

- Environmental Impact Assessment (NEERI)
- Buildings and Roads in Drought Prone Areas (CRRI, CBRI)
- Post Disaster Investigations, and relieve Operations (CSMCRI)

6.2.4.4. Cyclones

- Cyclone resistant buildings & structures: Design and Construction of Cyclone Shelters: Prediction of Cyclone Tracks: Wind Resistant Structures (SERC)
- Roads, Embankments, Buildings, Bridges etc in Cyclone Prone areas, Geotechnical study (CBRI, CRRI)
- Climate change and Storm Surge Studies (NIO, NPL)
- Computer Simulation of Cyclone & Mathematical Modeling (C-MMACS)
- Environmental Impact Assessment (NEERI)
- Post Cyclone Water Quality Mapping; Dealing with Contaminated water for purification (RRL (Bhu), CSMCRI, NCL, ITRC)
- Post Disaster Epidemics (IICB, CDRI)

6.2.4.5. Earthquake Disasters

- Geophysical Studies, Instrumentation, Monitoring, Occurrence and Prediction of Earthquakes Reservoir induced Seismicity (NGRI)
- Earthquake induced Tsunamis, Storm Surges, Submarine Stumping (NIO)
- Buildings in Seismic Areas; Strong Motion Seismographic Studies: Materials of Construction in the Seismic Area: Earthquake induced Landslides (CBRI)
- Computer Simulation & Modeling: GIS Studies (C-MMACS)
- Environmental Impact Assessment (NEERI)
- Highways & Bridges in Seismic Areas: Earthquake Induced Landslides (CRRI)
- Design Structures including Shelters in Seismic areas (SERC)

All these fragmented efforts needed an interface at the national level. Institutionalization of Natural disaster management would provide a platform for the convergence of experts and the identified areas.

Creation of a National Database and its eventual hookup with the international network, will be able to serve as a national clearinghouse of information. The concept like networking of concerned agencies and institutions for sharing database, through use of information technology must be promoted in coming years. This will actually help in building the monitoring and warning systems for landslide hazard management. Thus it would be proper to create a clearinghouse of information in the area of landslide hazard to provide authentic and coherent data.

There is large amount of knowledge available in R&D and academic organization to deal with the subject most scientifically. However, the affected people in the landslide-impacted area have very little knowledge to deal with such calamities. It is, therefore, required to evolve a national strategy for training and retraining of staff, NGOs and public at all aspects of landslide hazard and management. Such an initiative would bind together the developing world facing similar problems.

Government of India–UNDP Umbrella Project had invested significantly in laying the foundation for providing policy guidelines and scientific and technological support to the national task of Natural Disaster Mitigation. The project had also invested a great deal in fostering and promoting cooperation amongst developing countries, and in addressing their training needs under TCDC component of the project. It was, therefore, natural for the project to expect that this good work be put on autopilot so that the momentum gained would help sustain the motion, beyond the project.

The TPR meeting and the Programme Steering Committee meeting of Umbrella Project, therefore, took the decision to park the activity in a national institute which should not only be willing to accept the responsibility but should also have national and international standing.

The initiative to institutionalize was, therefore, a logical step in the implementation of the decision taken at the project TPR.

6.2.5. Selection of Nodal Agency

There were a number of institutions in India, which could qualify to be chosen as the Nodal Agency. Many of them might even be classed as Centres of Excellence. Even within the CSIR system itself, there are a number of national laboratories, which are internationally known for their contribution to improved understanding of various facets of National Disasters.

The National Remote Sensing Agency in Hyderabad is among one of the acknowledged leaders in exploiting the potential of remote sensing in studying the whole range of disaster related problems from pre-disaster mapping to post-disaster relief and rehabilitation. The Geological Survey of India, the Wadia Institute of Himalayan Geology, the University of Roorkee, the Indian Institutes of Technology at Mumbai and Kanpur, the Snow Avalanche Study Establishment, the Defence Research and Development Organisation, the Border Roads Organisation and the India Meteorology Department are among many other Institutions known for their highly useful contributions.

The CRRI, New Delhi was chosen to coordinate the activity because of the following reasons:

- It had a very active role in carrying out the Natural Disaster-related activities throughout the period of Umbrella Project, and therefore had the total familiarity with the objectives before it. The intimate association with the project also gave CRRI the advantage of continuity of work, connectivity with the developing countries, familiarity with the TOKTEN experts, and the ready access to existing institutional database.
- CRRI is nationally and internationally known for its expertise in the area of landslide disasters for the last four decades. It has acquired familiarity with the different types of Natural Disasters especially those affecting the road networks. CRRI is also very closely associated with Permanent International Association of Road Congress (World Road Congress) Group on Natural Disasters.
- Organizing workshops, brain storming sessions, seminars and conferences constitute a normal part of CRRI's Charter. The Institute also

organizes training programmes at various levels, and has the institutional capacity to design and implement tailor-cut training programmes.

- CRRI has a very good library, being connected with other important libraries; facilitating digital transmission of data and of disaster-related information.

6.2.6. Database activities

A database was developed with the following information:

- Names and full addresses of institutions dealing with natural disasters in India and abroad. Cataloguing of major natural disasters in India.
- Networking with developing countries, especially the partner countries already associated with institutions in India.
- Networking with NRIs working in the field of natural disasters.
- Information on NGOs and consultants in the area of natural disasters
- On-line dialogues on important issues connected with natural disasters
- CRRI's useable outputs in the area of natural disasters, with the effort to enlarge and extend the activity to other institutions

6.2.7. Training activities

CRRI organized training programmes in the area of Natural Disaster Reduction at the various levels. The main emphasis was on training of trainers. Some of the chosen themes of the training programmes are:

- Policy of natural disasters for senior executives
- Role of R&D institutions in the natural disaster mitigation.
- Field instrumentation, monitoring and early warning.
- Hazard, damage and risk assessment.

- Mapping of hazard and vulnerability for site selection in hazardous areas.
- Design of roads and embankments in hazardous areas, and
- Design of remedial measure against landslides.

6.3. Post-Umbrella Project Scenario

Both the Herbal Drug and Natural Disaster activities have flourished ever since their institutionalization as evident from the information furnished above. If one were to do cost benefit analyses, just these two instutionalized activities would more than justify TOKTEN Umbrella initiative.

Chapter 7

Gauging the Success of TOKTEN as a Separate Stream

In this chapter, the TOKTEN Project is viewed as an individual TOKTEN assignment, focusing on the 'consultant' and the 'host recipient' as the two basic players, interfaced by the executing agency. A study of knowledge transfer with the aim to assess the success of transfer at this micro-level (as TOKTEN assignment) is considered. The study is grounded in organizational information processing and interdependence theories and social relationship. The approach helps to simplify complicated and interrelated relationships among many variables ... [Dess, G G; 1993].

The basic objective of TOKTEN was to transfer knowledge and the success of this transfer depended on proper detection, processing and utilization of information at various stages. In the context of S&T, the application of knowledge is technology. In the operations context, technology is technical knowledge or know-how applied to improve an organizations ability to provide products and services [Bohn, R E; 1994]. The know-how could be a physical process, software design, a manual, an operating procedure, a patent, a technique or a contact person. The role of TOKTEN consultants, in particular, has been transfer of knowledge which included trouble shooting, suggestions on new approach to a problem, improved manufacturing processes, development or improvement of product, analysis/solving of problem, enhancement of service efficiencies, formulation of collaborative projects, skill enhancement or development, lectures/seminars, short course, and development of curriculum. However, assimilation of new knowledge has several distinct dimensions such as the level and uncertainty/clarity of the knowledge [Daft, R L; 1986], its complexity and applicability, absorptive capacity of the host and tacitness. Gray and Meister have found that the strength of knowledge sourcing is moderated by the degree to which they find their job intellectually rewarding besides the strength of individual's learning orientation [Gray, Peter H; 2004]. Simonin has carried out an empirical study on the simultaneous effects of learning intent, learning capacity, knowledge

ambiguity, and its two key antecedents - tacitness and partner protectiveness on technological knowledge transfer [Simonin, B L; 2004]. Consistently, learning intent (as a driver) and knowledge ambiguity (as an impediment) emerge as the most significant determinants of knowledge transfer. Moreover, the effects of partner's protectiveness and learning capacity are moderated by the firm's own culture towards learning, its size, its structural form of the alliance, and the fact that its partners may or may not be competitors.

Broadly, much of the learning depends on scientific culture of an institution, competency of its personnel, infrastructure/facilities available in the institute and interest of the recipient organization. These factors should be properly addressed for achieving success in the transfer of knowledge.

At the simplest level, success of transfer of knowledge may be attributed to the information processing capacity between the information donor and the information recipient. The contingent perspective is to find the appropriate match or fit between the given levels of knowledge processing requirements prior to transfer with a given level of knowledge processing capacity after the transfer. Since the levels of the donor and the recipient are not always the same, the degree of efficiency in knowledge transfer can be measured in terms of differences in capacity, which could be either way. Thus, when capacity of recipient to process or absorb the knowledge is adequate, then the transfer may be termed as 'efficient'. But, when the capacity of recipient to receive knowledge is relatively low, the transfer of knowledge may be termed as 'inefficient'. In respect of TOKTEN, as found in a sample survey, the contribution by the consultant to the host/user organisations was concluded to be optimal (Section 4.8.7).

7.1. Success of Projects

Any assessment of whether or not a project was successful, necessarily assumes that it is known what the project was supposed to accomplish with clearly defined expectations [Berk, Richard A; 1990]. With the exploding growth in S&T knowledge and in the present day competitive world, the need for acquisition of new knowledge from within and outside the country and its efficient utilization have become a necessity. Studies have shown that ideas

for successful innovation come mostly from outside [Meyer, S; 1969]. Leading multinationals like Dupont, GE, etc. have moved from 5% external sourcing ten years ago to 20% today [Hirwani, R R; 2000].

The firms are increasing concentrating on core competencies leading to rising dependency on external sourcing. To meet this requirement, mechanisms like organized scouting for technologies, purchase/licensing-through patents, products, know-how, machinery and also utilizing foreign experts and training are in vogue today. TOKTEN was conceived as one of the instruments for voluntary transfer of knowledge by the expatriates.

Broadly, TOKTEN-India was conceived as:

- An instrument for national capacity building and for sustaining competitive advantage in science and technology
- A catalyst for achieving national development priorities
- A project that anchors expatriate nationals to their motherland

The immediate objective in the first phase was to transfer knowledge in specific areas of science and technology. Though no specific areas of science and technology were singled out in the first project document, the second phase document mentions microelectronics, semiconductor technology, lasers, fiber optics, metallurgy and materials science, molecular and cellular biology and energy (coal, biomass and solar cells). These documents fixed a target of 55-60 consultants to be invited in the first phase and another 140-150 in the second phase to transfer knowledge/ know-how in crucial and frontier areas of research and development to accelerate India's development efforts. These consultants were invited as per demand of the R&D institutions, universities and industries of India and were selected by a High Powered Committee, constituted under this project.

The study has focused on the following three stages of knowledge transfer process in the context of TOKTEN assignment:

Phase 1: Formative stage
Phase 2: Implementation stage
Phase 3: Outcome stage

The formative stage refers to the designing and planning of this Project. The implementation stage includes the operational phase and in the last phase, the impact has been considered. It was important to identify the 'Match' or 'Fit' along the line of these three broad stages. This is done by taking recourse to the theory of interdependence, information processing theory and organizational interaction between knowledge source and the recipient. The objective of the study is to base the degree of success of transfer of knowledge from the expatriate nationals (transferor) to Indian host recipients (transferee) on the established theories and understanding [Stock, Gregory N; 2000].

7.2. Organizational theory and Transfer of Knowledge

Information processing is the purposeful generation, aggregation, transformation and dissemination of information for realizing some organizational task [Tushman, M L; 1978]. In the context of TOKTEN, the task was the transfer of knowledge. Even though the specific sub-tasks and information transformation requirement could differ among knowledge transfer situations, all knowledge transfers involved some information processing to conduct the transfer. It was therefore chosen to base the knowledge transfer process on the theory of organizational information processing. The theory indicates that organizational tasks pose information-processing requirements to the organization. Different mechanisms employed by the organization provide information processing capabilities. The degrees to which requirements of expertise and availability of expertise; and further, the degrees to which availability of expertise and capabilities of the recipient are matched determine the efficiency of task accomplished.

A key consideration was the relationship between the players engaged in the knowledge transfer process. The two players, who were distinct, were engaged in work task of knowledge transfer, where as the two were bound by

the cultural relationship. Cabo has examined the effect of cultural differences on the participation of research organizations from different countries and has concluded that cultural similarities tend to increase the effectiveness of participation and require less frequent consultation and coordination [Cabo, R G; 1994]. Lorange and Roos have shown that success of international strategic alliance is linked, at least in part, to the firm's ability to tailor its approach to cultures [Lorange, Peter; 1993]. Basically, the NRI factor and the consequent cultural affinity eliminated the feeling of competitiveness.

Walton has identified three essential components under the theory of organizational interrelationships: information exchange, interunit interaction, and attitude towards other unit [Walton, R E; 1996]. Besides, it is known that the context defines the content. In the context of TOKTEN assignment, the three broad inter-organizational factors were denoted as follows.

- Communication between consultant and host
- Cooperation between two organizations
- Coordination by the implementing agency

7.3. Dimensions of this study

Organizational information processing theory considers task uncertainty as lack of knowledge about the method to accomplish the task. In the specific case of TOKTEN assignment, this could be treated as uncertainty in locating appropriate expert and also uncertainty associated with the know-how *per-se,* that is uncertainty with regard to extent of reliability. Under the organizational information processing theory, the impact of uncertainty is borne out by the requirement of organizational interaction and information processing.

In the context of TOKTEN, the uncertainty was considered as the difference between the level of knowledge required by the recipient to acquire and assimilate the information and the level of knowledge possessed by the recipient. The challenge therefore lay in recognizing the exact need of knowledge on the one hand and resourcing the required knowledge, embedded in the NRI, on the other. In general, knowledge that is more novel,

complex, and/or tacit is likely to be more equivocal than knowledge that is familiar, simple, or well-defined. Organizational interaction characterizes the nature of the inter-organizational relationship between the consultant and the recipient. The requirements of organizational interaction and information processing spell out the amount of communication, cooperation and coordination that would be required.

Communication here has been referred to as the interaction between a coordinating agency and a consultant, between the coordinating agency and the client, and between a consultant and the client. The transfer of knowledge during the interaction may include explicit and/or tacit knowledge. Explicit knowledge is that part of knowledge base which can be codified or made explicit in the form of diagrams, designs, blueprints, specifications, theories etc. Tacit knowledge is individual's personal perception, understanding by experience. It is within the human cognitive domain [Nonaka, I; 1995]. Pradosh Nath et al [Nath, Pradosh; 2002] have put forth 'reliability' and 'individual conviction' as the two components of knowledge. It is explained that reliability is that part of knowledge which is logical, verifiable, explainable and tangible. On the other hand, individuals conviction is based on one's own experience, understanding and is intangible. Thus tacit knowledge is difficult to communicate to others and requires intensive human contact and interaction. The professionalism in communication established between the players determines to a large extent of its success.

Cooperation has been assessed as the willingness of a partner to pursue mutually compatible interests rather than to act opportunistically [Das, T K; 1998]. TOKTEN project was not a commercial venture. Some of the acknowledged attributes of international R&D cooperation, with particular reference to TOKTEN were:

- It involved voluntary sharing of information [UNDP, 1990],
- It involved mutual trust [Wong, A; 1984; Katharine Barker; Liming Liang, 2001; Rao, M K D; 2003] and
- It entailed mutual relationship [Saji, K B; 2000].

Coordination was taken as the interfacing role of the executing agency which initiates, plans and arranges the transfer of knowledge. A database of NRI scientists, their current activities, in-house potential, patent holdings etc. was maintained. It needed necessary resources and skills to aggressively monitor external capabilities and developments for appropriate leveraging.

Having defined the terminologies used in the study in different context, the intent of the following part is to capture the nature of knowledge to be transferred, the activities and interactions across the two players and the contingent relationship between knowledge and organization, all at the micro level of TOKTEN assignment.

7.4. Lessons from TOKTEN experiences

The TOKTEN—Palestine programme has developed a web-page for communication which includes among other things a mechanism to keep the expatriate Palestinians updated about developmental issues and programmes at home in the areas of science, technology, governance and other fields. The success of TOKTEN—Iran is attributed to the effective coordination with over forty stakeholders in the TOKTEN project, through their representation in a Steering Working Committee. An evaluation of TOKTEN and STAR programme being implemented in China has revealed that the more specific the technical area of assistance, the more likely is the impact. The Chinese country paper provides case studies in econometrics, IT in libraries, potato harvesting, forest plant ecology [UNDP, 2000]. For example, correct identification of potato breed to be imported besides the breeding technique by TOKTEN experts in Dutch University and the counterpart Institute of Vegetable & Flowers, Chinese Academy of Agricultural Sciences led to success in potato yield per hector in China.

7.5. Measuring the interrelationships between Consultant and Recipient

The key elements that determine operational success of projects in general are time taken for completion, cost involved, and technical performance

[Meredith, J R; 1995]. However, in the specific case study of TOKTEN, wherein the consultant and host were juxtaposed, the emphasis on unit of analysis needed modification.

Shiva Ramu has suggested a set of six variables to measure interrelationships in international joint ventures [Ramu, S Shiva; 1997], these being interactions, openness, trust, cooperation, integration and satisfaction. Interaction and exchange of information play very important roles in fostering successful partner relationship. The quality and scope of communication between the provider and the user depends on openness. This can be seen in the contribution of tacit knowledge by the consultant. There is a close link between openness and trust. Moorman et al define trust as the willingness to rely on an exchange partner in whom one has confidence [Moorman, C; 1992]. Trust ensures reliability and fulfillment of commitment. The trust further leads to cooperation which is coordination activities carried out by the implementing agency. Cooperation leads to integration of strategic relationships. Finally, the consequence of the relationship will be the performance satisfaction experienced by the consultant and the recipient, which may be termed as successful transfer of know-how.

At the micro-level study of TOKTEN, the transfer of knowledge from the consultant may be seen to be affected by whether it is tacit or explicit. At the receiving end, individual's knowledge comprised an individual's own ability and knowledge acquired through education, training, experience and cognition. Hence, the absorption and utilization of knowledge transferred basically depended on level of this base knowledge and skill possessed by the human resource, which was the internal capability. Moreover, the language, ethos, value systems, academic freedom, promotional policies etc. also influenced the impact of transfer. Hemmert has found that the acquisition of technological knowledge for the development of new products and processes is influenced by the availability and quality of internal resources (personnel and capital); the availability and quality of external technological knowledge; the political, legal and administrative environment; and the organization of knowledge transfer activities by the firms [Hemmert, Martin; 2004].

Thus, in the entire process of transfer of knowledge from the consultant to the recipient, the recipient host/user organization was expected to have the basic facilities with a certain level of knowledge and understanding in the subject. The issue then was how much contribution by the consultant could be considered optimal? This was judged in relation to the capacity to absorb and assimilate the knowledge transferred by the consultant to the recipient. This has been suggested by the Chinese in their country paper: "If the absorptive capacity of a recipient is very low, then the required knowledge input by the TOKTEN consultant will be high, say between 75% to even 100%. On the other hand, if the recipient is at the cutting edge then the external input may be considered to be less than 25%. Thus, the optimal situation may be considered to lie between 25% and 75%" (UNDP, 2000).

In this situation where does India stand is a matter of debate. Taking recourse to the RAND report which considers India to be among the scientifically proficient countries (See Appendix 5, under Question 2, Discussions), India possesses an overall S&T capacity index value at or over the international average, but they are not uniformly capable as the advanced country. In order to move from scientifically proficient position to scientifically advanced state, certain measures are required to become uniformly capable. In the context of the TOKTEN, this amounts to moving up from profuse requirement of outside consultancy to the 'optimal' area and beyond. One of the ways to advance could be by arranging horizontal transfer of knowledge and sharing of facilities within India between centres of excellence like IITs, IISc and other less developed R&D centres.

Turkey has an "In-country TOKTEN Programme" under which consultants/professors of advanced institutions within the country provided consultancy to their less developed sister institutions [UNDP, 1988]. In China the provincial institutions are invited for training organized in Beijing. The Chinese Academy of Social Sciences, Chinese Academy of Sciences and the Chinese Academy of Agricultural Sciences help the provincial academic institutions in formulating their proposals for TOKTEN consultancy. In the context of TOKTEN, India should focus on its priority areas like education,

governance, sustainable livelihood and environment and try to attain self-sufficiency in expertise after initial backup of foreign consultancy. Poland claims that there is significant drop in seeking TOKTEN consultancies as it has gained sufficient expertise through TOKTEN consultancies over nine years [UNDP, 1988].

Given the situation of TOKTEN assignments, the dynamics of knowledge transfer in TOKTEN, at the micro-level have been depicted in Figure 5.

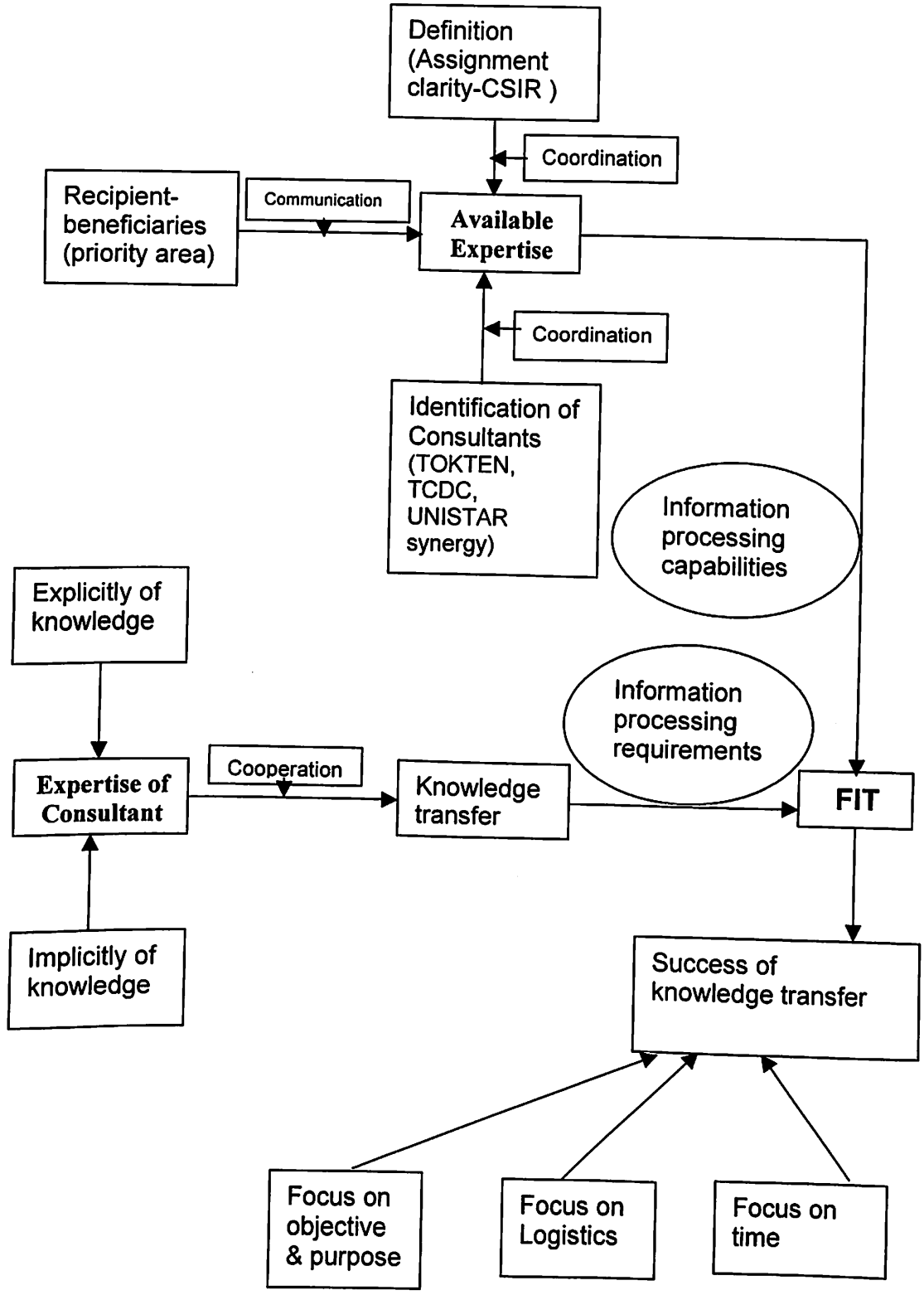


Figure 5: Organizational theory of information processing as applied to gauging success of TOKTEN assignment
Based on G N Stock and M V Tatikonda [Stock, Gregory N; 2000]

As may be seen in Figure 5, the request for the need of a consultant (TOKTEN, TCDC or UNISTAR) within the priority area flows from the beneficiary (demand-driven) to the implementing agency at the national level. The implementing agency in consultation with the host institution defines the terms of reference of the TOKTEN consultant. This requires multiple interactions to match the requirements of the host/user institutions with the options available from the three streams of expertise. The consultant too can deliver explicit and implicit knowledge. The success of transfer is depicted to be a match between the expert's capacity to transfer knowledge and team spirit of the recipients to absorb that knowledge. As may be seen, some of the prerequisites for success are the focus on the identified task, arrangements of travel, boarding, lodging, etc. and timeliness of implementation.

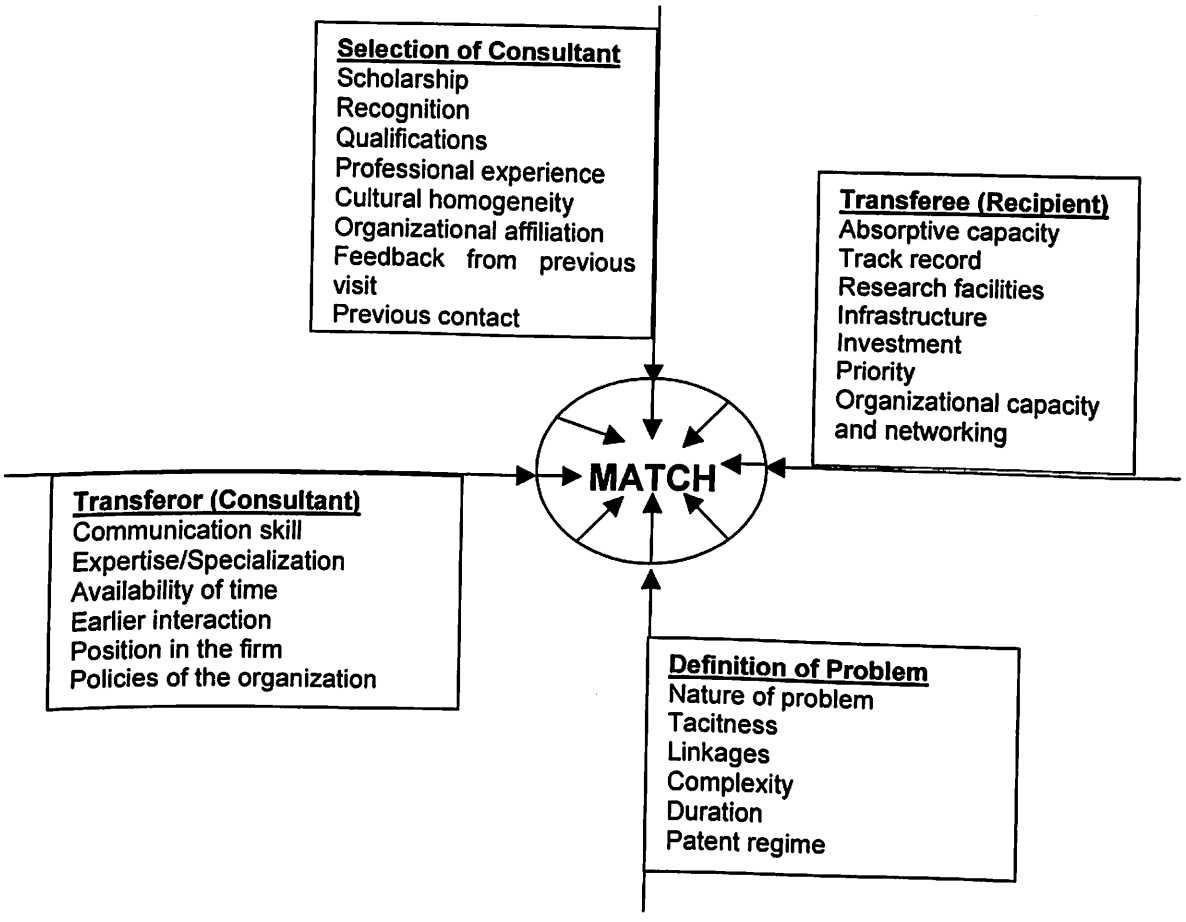


Figure 6: Factors that influence the match in a TOKTEN assignment

As seen in Figure 6, appropriate identification of the expert matching to client's need should facilitate knowledge transfer. The Chinese experience in precise identification of the problem at its narrow level, given in section 9.4, may be sited. Besides, the knowledge transfer will be effective if the information processing capabilities (provided by the organizational capacity and interactions/sharing) fit the information processing requirements (determined by the knowledge certainty). Uncertainty with regard to reliability of knowledge may be associated with the know-how, techniques, technologies, software, methodology adopted or even the expert engaged. Prof. Yasar Onel, a Turkish expatriate working at University of Iowa could successfully integrated his research work abroad with two of the Universities in Turkey, because of the matching qualities of scientists [Tozar, Zeynep; 2000].

The following are the inferences drawn from the exercise:

1. The degree of success of knowledge transfer is directly proportional to the processing capability of the recipient (see Figure 7). Consequently, certain 'enabling conditions' to achieve minimal level of capacity is essential for success.

2. The degree of success of knowledge transfer is inversely proportional to the uncertainty of explicitness of knowledge transferred (see Figure 8).

3. The knowledge transfer is successful if the objective of user is satisfactorily met.

4. Cultural affinity facilitates transfer of knowledge.

5. Success of a project depends on the clarity in defining the objective. The purpose for which the consultancy is being sought and terms of reference of the expert must be clearly spelt out.

6. Professionalism in handling the visit of the consultant and his/her timely visit play important roles in making the assignment a success.

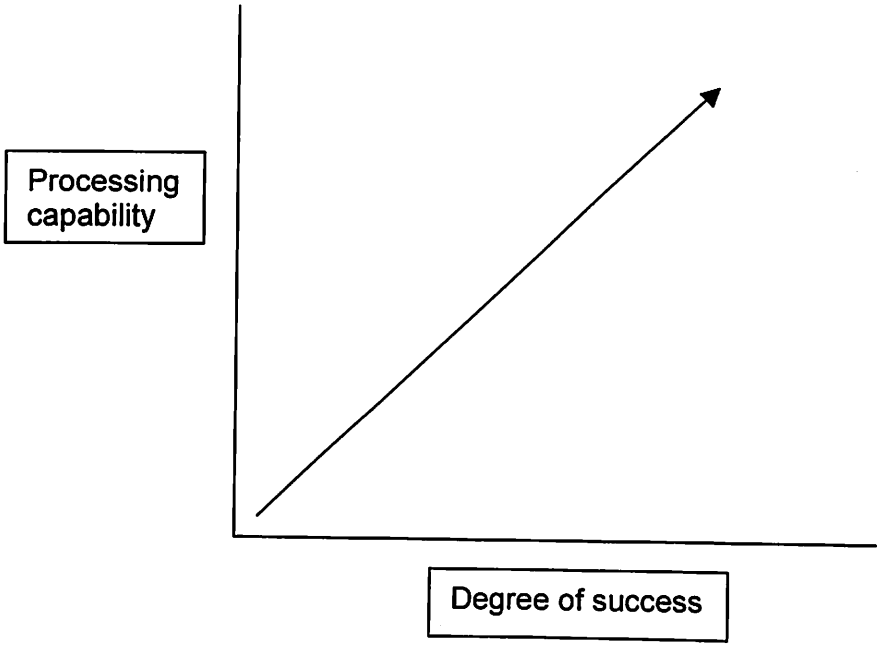


Figure 7: Relationship between Capability of Processing and Degree of Success

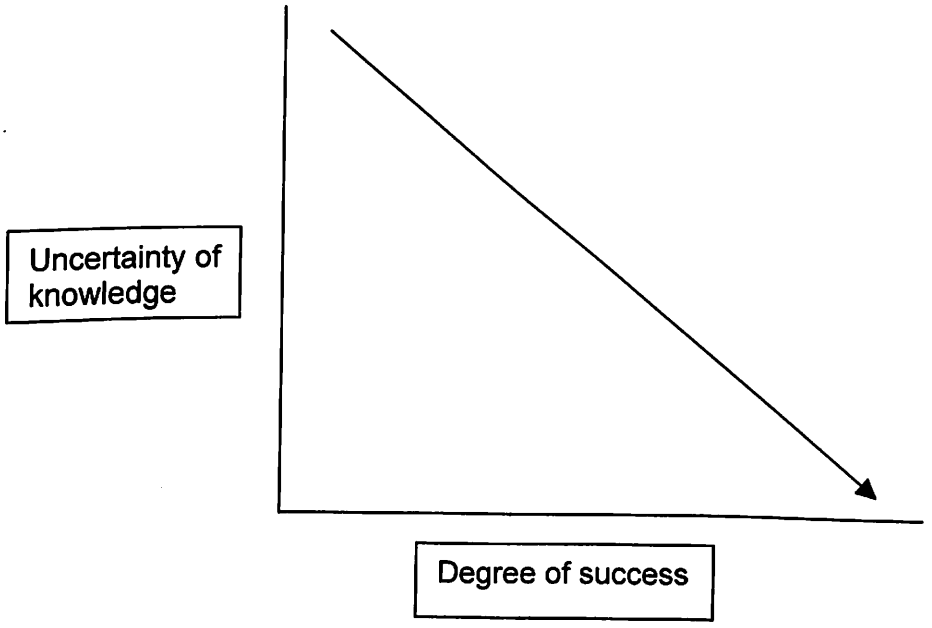


Figure 8:Relationship between uncertainty of knowledge and degree of success

7.6. An Approach to Measurement of Success of TOKTEN as a separate stream

Based on the exposition of ideas at the micro-level in this chapter, to a significant extent, one can have a premonition of degree of success of a TOKTEN visit by recourse to answering the following questions (Parts A and B) as objectively as possible:

Part A

Indicator	Grading on a ten point scale (1 – 10)
Professional caliber of the consultant	
Processing capacity of the recipient	
Communication compatibility between the consultant and the recipient	
Clarity of the objective of consultancy and task, and purpose	
Level of professional standing and coordination capacity of the recipient organization	
Degree of cultural affinity between the consultant and the recipient	
Explicitness of knowledge (inverse of uncertainty and complexity)	

Of the theoretically maximum score of 70, a visit is rated as 'successful' if the grading were to exceed 70% or score of 50.

Part B

Indicator	Grading on a ten point scale (1 – 10)
How satisfactorily the end objectives of the visit were achieved?	
How much was the value the recipient attached to the training, product or process delivered?	
Degree of professionalism and timeliness in handling of the visit?	
What other side-benefits could be accrued?	
Possibility of long-term cooperation	

'Success' will demand crossing of 70% score.

Chapter 8

Methodology for Gauging the Degree of Success of TOKTEN Umbrella Project

8.1. The need for a rational approach

Most of the current programme evaluation approaches tend to be either lame or blind, or at best rest on crutches. We have delivered projects without appreciation of the end objectives or macro-view or sustainability. In such cases inference of success is usually being drawn just by sensing how well it has been run and how efficiently the allocated budget has been spent. Such approaches are blind.

Projects usually tender too much respect to quantity at the expense of quality. For instance, sole considerations taken are number of workshops organized or number of training programmes organized. Such approaches will not carry us very far and may be regarded as lame.

Some projects although are efficiently run, do end with one time gain. They serve a very limited purpose without even caring to look into the future needs. Such projects are not able to contribute much to the development of the country and may be regarded to be on crutches.

On the other end of the spectrum, there are projects, which do leave behind visible success with a trail of outputs of lasting value. Several new ideas and leads, products and processes and trained personnel become gifts of such projects. Such projects, when backed by good management turn highly successful. And TOKTEN Umbrella Project has been one such project.

However, we need a user-friendly, systematic and transparent approach to gauge degree of success of all types of projects, big or small. Objective judgment on how an

activity, a project or a programme has fared is possible only through such an approach.

8.2. Some thoughts on the measurement of success

As presented in the previous chapter with regard to TOKTEN-separate stream, measurement of success was based on interpreting of responses to a set of pertinent questions by value judgment. Normally an approved project comes under watch the moment it gets a start; different players begin to use their own binoculars or microscopes to look at its elements like soundness of the plan and preparatory work, adequacy and quality of implementation machinery, openness and transparency of procedures followed, periodicity of meetings and timeliness in actions, and the quality and completeness of reporting. All these aspects are important and deserve attention but cannot be taken at their face value unless the above information is seen as only subordinate to the actual outcome vis a vis the end objectives, and the short and long range impact the delivered outputs are poised to make.

Numbers usually speak louder than quality, as they are more visible. Since very few have an eye for quality, numbers tend to mould or sway opinions. A well attended workshop on a theme of burning importance, organized in a five star ambience, if timely conducted and serviced, gets pronounced as success even before the outputs or their impact or likely impact is known. Sometimes first impressions get so much embedded in the minds of participating decision makers that deficiencies in meeting the end objectives get masked. Clearly there is a need to be cautious while putting value tags on the information and in arriving at conclusions.

The task of gauging success of TOKTEN umbrella project was very difficult because judging its success would mean giving a verdict on the collective impact of all the outputs of various activities and sub-activities carried out under the Umbrella Project by different actors at different locations. Since it is often not practical to wait till the end of the project to see the actual outcome and feel the real impact, it is therefore only to be anticipated that progress could be judged by early indicators like visibility of

actions, number of activities and their respective qualities, timeliness, repute of professionals involved and national standing of host organizations.

In the case of TOKTEN Umbrella Project, numerous other factors streaked in and needed attention. One such factor was structuring of the project operation through a string of committees, introduced earlier. Each one of them had well-defined terms of reference and roles. The efficiencies with which the meetings of Policy Planning, Steering, High Powered and Tripartite Review Committees were managed and the body language of those who carried weight in their voices, generated favourable climate for the race to success. Even if the real success did not depend only on what these committees thought about the project, the negative views had the potential to erode eventual success.

Yet another such factor was the quality of match between human resource mobilized and the actual requirements of a particular activity. Quality of experts' database, definition of actual requirement, rigors of match-making, transparency in selection process thus became the pre-requisites. Since Umbrella programme involved TCDC and UNISTAR experts as well, quality of their selection became equally important. It was for this reason that healthy procedures were put in place to make this key activity a part of normal project life. The path to success was thus paved with this initiative.

The project was evaluated by UNDP and DEA, for its success in terms of the funds disbursed against specific allocations within a specific time-frame. While doing so they did not realize the fallacy that with the pooling of resources and having the concept of cost-sharing between projects of similar interests, actual funds disbursed could be significantly lower than the original allocation. Despite improved quality of outputs (due to synergy) at lower costs, it was wrong to judge the progress in terms of spending, the way it was done.

Another back of the envelope calculation, painful to come across, was to judge the success in terms of money spent per activity or per visit. Referring to Table 5, during the Umbrella period, the investment of US $2 million on TOKTEN (in cash + kind) facilitated 82 visits, costing about US $25000 (approx. Rs.12 lakh, at the then

conversion rate of Rs.46 for US$1) per visit. Considering visits of experts under TCDC and UNISTAR streams, a total of 267 visits were managed within US$2 million (in cash + kind) on the Umbrella Project. Thus about US $7500, that is, approx. Rs.3.5 lakh was spent per visit. Was the visit worth the weight of money? Such a question could only be answered if one were to weigh the ideas generated, leads provided, assistance provided to speedup the processes or product development and so on. Viewed differently, the costs would have been doubled if the market consultancy fee were paid as indeed many consultants estimated it at US $20,000 (over Rs. 9 lakh) per consultant for a six-week visit (see section 4.8.1).

Similarly, one could conclude that the project yielded 18 Workshops, each on an average costing less than US $22000, approx Rs.10 lakh (CSIR, August 1998). Does such a calculation really mean much? The amount would be more than paid even if one workshop delivers. And in fact, a large majority of them yielded good results and paved great hopes for the future.

The simplest way to get an idea of the degree of success would be to put price tag on every achieved result. And conclusion would surprise many, besides silencing the critics.

8.3. Towards a user-friendly approach to measure success of a project

In order to facilitate evaluation, for the sake of convenience, the total project can be divided in to a set of discrete activities, called components. Each activity/ component could then be (a) ranked in terms of its relative importance vis a vis other components, and (b) separately monitored, assessed and rated in accordance with the outputs by assigning numerical scores. Although it is practically impossible to obtain a unanimous agreement on highly subjective matters such as deciding on the relative ranking and scores, a good convergence has invariably been found by recourse to consultations and collective wisdom. This point will get illustrated in the subsequent paragraphs. The challenge in this case was to identify both tangible and intangible gains associated with every activity and express them quantitatively to reflect the individual

gains more closely and realistically. Besides, the varying gains from different activities within the overall framework of a project, the other challenge was to integrate the gains of individual activities over the whole project. Assigned weights were indicators of preference of one activity over the other.

Gauging the degree of success of a project as big and complex as the TOKTEN Umbrella Project involves continuous tracking of all facets of the individual discrete activities it is composed of, as well as their individual and cumulative impact in the short and the long run. Any such assessment naturally requires input data sets to be quantified and validated to fit for a meaningful analysis. For instance, a particular event like a National Workshop on Herbal Drugs, upon evaluation of implementation processes adopted and the end results achieved would reveal its elemental contribution towards the overall objectives of the programme. The end results of all such activities under the programme will then require putting all the results together, as objectively and transparently as possible, to enable holistic gauging of the outcome of the programme as a whole.

A distinction is necessary between the mere summation of outputs of different individual activities and the summation of their corresponding outcome. As stated before, it will be wrong to judge a TOKTEN initiative merely in terms of man weeks of the expert visits or by the number of workshops facilitated or number of seminars delivered during a given visit. Likewise, it would be inappropriate to judge a purely TCDC initiative in terms of the number of developing countries represented and the related training imparted. A UNISTAR initiative will similarly carry much higher expectations than introduction to a new technology or trouble shooting in the host industry.

Traditionally TOKTEN, TCDC and UNISTAR projects were implemented as parallel independent streams, virtually without any inter-connection. The assignments were also monitored and evaluated as independent activities, based on rapid analyses of the activity outputs measured against an approved projected time-bound action plan. UNDP was generally satisfied if the entire allocated budget got timely consumed to deliver pre-determined outputs, and performance audit had nothing negative to report.

The DEA, GOI demanded additionally transparency in administrative and financial decision-making and stricter scrutiny of overseas visits by the project staff. CSIR, the implementing agency, measured the success of these activities chiefly through the impact these activities made. This assessment was largely subjective, based on the internal reports, selective feedback from experts, and outputs delivered. Observable, direct returns on investment and opinions of more dominant of beneficiaries swayed judgment on the degree of success.

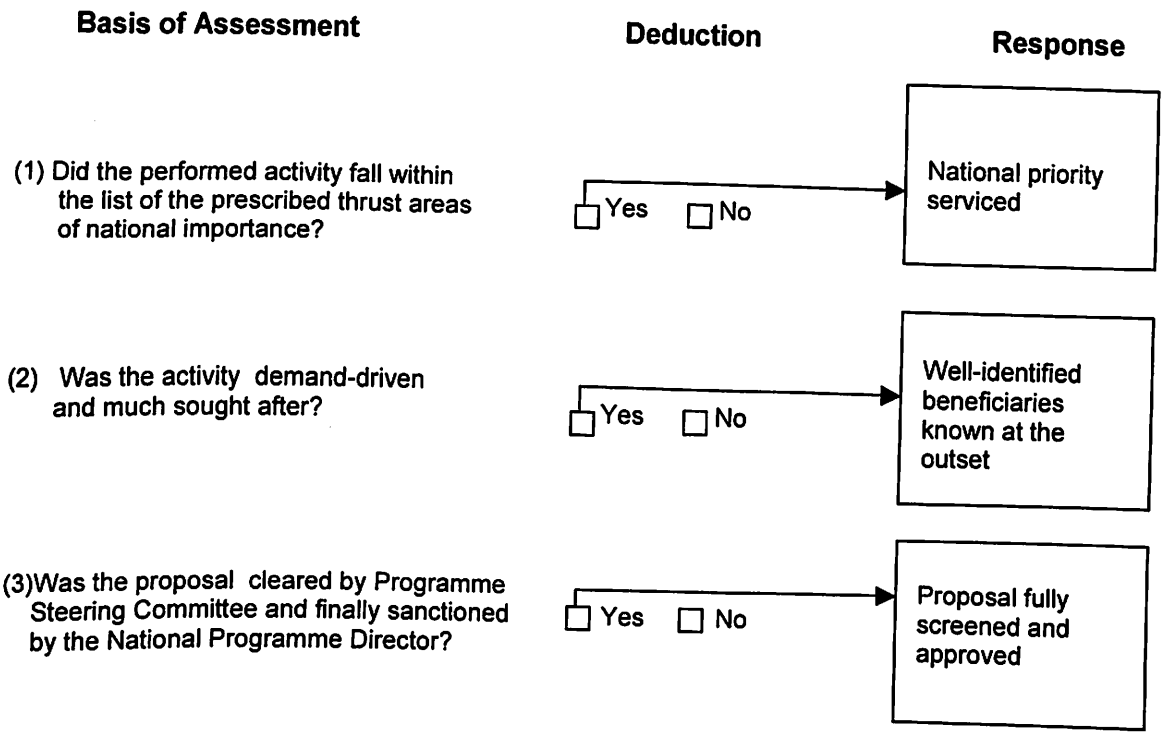
Unification of TOKTEN, TCDC and UNISTAR components marked the introduction of a new culture of project implementation. Independent components began to be regarded more as instruments of an orchestra rather than separate mouthpieces. Each component was not only expected to supplement/complement the other two but vibrate in resonance with one another. Synergy between TOKTEN, TCDC and UNISTAR components thus became the heartbeat of the unified Umbrella Programme promising higher yield of superior quality outputs. Accepted method of evaluation and monitoring was, however, not available to measure success or estimate cost-benefit. The topic of the study was thus conceived to fill-in the vacuum.

8.4. Nature of Activities under the Umbrella Project

Umbrella Project involved activities like thematic workshops, round-table meetings, expert visits to academic institutions and industries, all aimed at about a dozen key focus areas. Each one of them therefore had a well-articulated set of objectives and pinpointed deliverables. Ideally, the application of the suggested approach required revisiting all the various activities carried out during the life-span of the Umbrella Project and rate them according to the weights of their respective outcomes. The results so obtained were then combined to arrive at the overall success rating of the programme. However, considering the constraints in collection of responses from all the above participants, subjective figures were used to illustrate the approach.

8.5. Gauging Degree of Success of an isolated activity under the Umbrella Programme

Chapter 7 dealt with approach to gauging the success of TOKTEN as a separate stream decoupled from TCDC, UNISTAR or any other programme. This section deals with evaluation of an isolated activity of TOKTEN. The following three point Qualifying Test seems obligatory for every activity:



A framework covering issues that need to be addressed at the macro- and micro-levels to assess the performance of each of the activities of the Umbrella Project is presented below. For the development of the matrix model, the major elements of success and the means of achieving stipulated specific objectives were based on the collective wisdom of a cross section of institutions and individuals from the Governmental Departments, UNDP, R&D Laboratories, Universities and Industries associated with the programme, during the period 1997-2001. The queries have been categorized under the following four major considerations:

(A) Rating of Activity Planning and Implementation
(B) Rating of Operational Efficiency
(C) Rating of Impact of the Activity
(D) Fulfillment of Administrative Requirements

In a sense these yardsticks should seek the outcomes, rather than the outputs. Design of the project, timeliness of the implementation of the approved activities, efficient running of the project, time management of experts in India, the end results, and the impact they made on the national scene, education, industry and so on, all were assigned their own weight in decision-making.

The question then came: What were the core considerations in defining the success of the project like this and what were the special considerations that each actor or player or beneficiary had in mind while looking at the end outputs or results? This brought us to a multi-angle view of TOKTEN. The approach may be related to the concept of 'multiple perspectives' introduced by Harold Linstone [Linstone, A Harold; 1984].

A ten-point scale was chosen, as agreed by the maximum number of survey respondents, for scoring the views. The approach was straight forward, user-friendly and was tailored to suit any project on three broad parameters, namely design of the project, its implementation and its impact.

(A) Rating of Activity Planning and Implementation

1 10

(1)Was the activity planned in an interactive mode in consultation with all major national and international players?

(2) Was the mobilized intellectual expertise /input of sufficiently high quality and coverage?

(3) Was the performed activity parked at an institution /industry of national repute?

(4) Did the performed activity tapped advantage of synergy between TOKTEN, UNISTAR and TCDC?

(5) Were the participants truly representatives of the beneficiary organizations at sufficiently high levels of professional caliber?

(6) Were the pre- and post- event documentation of high quality and complete?

(7) Did the monitoring and evaluation framework and methodology prove efficient and effective?

(8) How weighty were recommendations, resolutions and the follow-up plan?

(B) Rating of Operational Efficiency

1 10

(1)How forceful was the demand from beneficiaries?

(2) How rigorous was the matchmaking between the expertise required and expertise identified and selected?

(3) How transparent and rigorous was the selection process and decision-making?

(4)Speed and quality of interfacing between, and among, the secretariat and all other players?

(5) National standing of the host organization and organizational infrastructure?

(6) Quality and number of beneficiaries, especially participation from the Indian industry?

(7) Quality of interaction between stakeholders and quality and timeliness of discussion papers?

(8) Quality and timeliness of preparatory meetings, other actions and reporting?

(C) Rating of Impact of the Activity

1 10

(1) Provided stimulus to national scientific/ economic/ industrial development or influenced government policy?

(2) Opened new avenues and/ or provided new lead for R & D / industrial development?

(3) Resulted in sustainability through institutionalization of the activity at the national level?

(4) Capacity building at national, state, local, institutional or group levels?

(5) Filled-in knowledge gaps/ trouble shooting for industry beneficiaries?

(6) Reinforced bilateral and multilateral linkages/signed MOUs?

(7) Provided access to information and ideas not otherwise available?

(8) Identified wasteful national effort in R& D and technology obsolescence?

(D) Fulfillment of Administrative Requirements

1 10

(1) Whether the selection of the activity and identification of experts were strictly as per the prescribed guidelines?

(2) Whether the meeting(s) of Programme Policy Committee appropriately timed and conducted?

(3) Whether the meeting(s) of Programme Steering Committee appropriately timed and conducted?

(4) Whether the meeting(s) of High Powered Committee appropriately timed and conducted?

(5) Whether the meetings of Organizing Committee appropriately timed and conducted?

(6) Whether the allocated budget fully and appropriately spent, satisfactory to the audit?

(8) Whether the activity report of the National Programme Coordinator transmitted to all parties on time and received well?

8.5.1. Recommended Scale as Indicator of Success of a Project

Once the activity was evaluated using the approach as suggested above, the following scale was deployed to gauge success of that activity:

Degree of Success	
Outstanding to Very High Score=81-100	• Umbrella Programme delivered **all** its end objectives at the highest level of quality and efficiency, utilizing synergy between its components, TOKTEN, TCDC and UNISTAR. • Individually as well as holistically perceived, **most** (if not all) of the planned activities. • Added **significant** momentum to the related ongoing national projects and programmes. • Created good **many** examples of institutionalization of activities, putting them on auto-pilot.
High Score=61-80	• Umbrella Programme delivered **most** of its end objectives at a very high level of quality, efficiency utilizing synergy between its components, TOKTEN, TCDC and UNISTAR. • Holistically perceived, most of the planned activities added **good** momentum to the related ongoing national projects and programmes. • Created **some** examples of institutionalization of activities putting them on an auto-pilot.
Moderate Score=41-60	• Umbrella Programme delivered **several** of its end objectives at a high level of quality, utilizing synergy between its components, TOKTEN, TCDC and UNISTAR. • Holistically perceived, some of the planned activities added **some** momentum to the related ongoing national projects and programmes. • Only a **few** examples of institutionalization of activities
Poor Score=<40	• Umbrella Programme delivered disjointed outputs of **poor** quality. • **Failed** to tap synergy between its components, TOKTEN, TCDC and UNISTAR. • Did **not** perceive holistically most of the planned activities • Added **little** to the related ongoing national projects and programmes.

8.6. Quantitative Analysis of Umbrella Activities

The substantiation of model entailed going back into the timescale and gathering multiple perceptions of a large number of players associated with the eighteen events held under the Umbrella Project. For instance, in the three TCDC workshops, viz. (i) Application of On-line Instrumentation in Pulp and Paper, Leather and Food Processing Industries, (ii) Herbal Drugs, and (iii) Natural Disaster Reduction: Policy Issues and Strategies, 135 experts under the Umbrella streams, bilateral partners and Indian resource persons, including from the Government Departments, voluntary organisations and NGOs took part. About 75 participants were from the developing countries and another 125 participants were from India. Based on these figures, the estimated number of total respondents for all the events was around 2000. Considering the practical constraints in collection of responses of players from all the above participants, figures based on value judgment of major players were used. Special care was taken to be as objective as possible by working out the points in consultation with the National Project Coordinator and others who were intimately associated with the project.

8.6.1. Analysis of the Umbrella Project Activities

For gauging the success of TOKTEN umbrella project, ordinarily it would have been essential to add the gains accrued from activities of synergy between TOKTEN. UNISTAR and TCDC to the gains of concurrently pursued TOKTEN, TCDC and UNISTAR as independent streams. However, the way project was run, the activities became seamless because of the continuous spotlight on key focus areas, which drove the workshops. What was substantively delivered has been reported earlier in the thesis on the basis of which the following analyses are being reported using the criteria discussed earlier.

(A) Rating of Activity Planning and Implementation

The fundamental considerations in determining success of TOKTEN Umbrella Project include scope of the event, reliability of the project/programme design, Identification of priority within a set of priorities and pinpointing of a specific theme to be addressed, synergy invoked among on-going and new programmes, soundness of monitoring and evaluation mechanism and finally the dissemination of gains and follow-up strategy.

SN	Success indicator	WS 1	WS 2	WS 3	WS 4	WS 5	WS 6	WS 7	WS 8	WS 9	WS 10	WS 11	WS 12	WS 13	WS 14	WS 15	WS 16	WS 17	WS 18
1	Planned with national & international players	9	9	8	8	8	9	8	9	9	8	8	9	9	9	9	8	8	9
2	Expertise of high quality & coverage	8	6	8	7	7	6	7	8	7	7	8	7	7	8	8	7	9	9
3	Activity hosted by institution/industry of national repute	8	8	9	8	9	9	7	9	6	7	8	9	7	8	9	9	8	7
4	Advantage of synergy between three streams taken	10	9	8	9	9	NA	NA	9	NA	8	8	8	8	9	9	9	9	NA
5	Participation at high levels of professional caliber	9	7	9	7	9	7	7	9	8	7	8	8	8	9	9	8	8	8
6	Pre and post event documentation of high quality	8	9	9	8	7	9	7	9	8	7	8	8	8	9	9	9	9	NA
7	Monitoring and evaluation framework efficient and effective	8	7	8	7	7	8	7	7	8	7	7	7	8	7	7	7	7	7
8	Weight of recommendations & follow-up plan	9	9	9	9	9	9	7	9	9	8	9	8	7	9	9	9	9	7
9	Total	69	64	68	63	65	57	50	69	55	59	64	64	62	68	69	66	67	47

WS-1 TCDC International Workshop and Training Programme on **Hydrogen Energy and Related Technologies,** Banaras Hindu University, Varanasi, November 29-December 1, 1996.

WS-2 TCDC International Workshop on **Application of On-line Instrumentation in Pulp and Paper, Leather and Food Processing Industries,** CEERI Centre, Chennai, February 3-11, 1997.

WS-3 TCDC International Workshop on **Advances in High Performance Concrete Technology and Its Applications,** SERC, Chennai, April 16-18, 1997.

WS-4 TCDC International Workshop cum Training Programme on **Herbal Drugs,** RRL, Jammu, September 18-22, 1997.

WS-5 TCDC International Workshop on **Application of Biotechnology in Bio-fertilizers and Bio-pesticides,** IIT, Delhi, October 15-18, 1997.

WS-6 Brain Storming Session on **Identification of Technology Needs of Small and Medium Enterprises in Developing Countries,** COSTED Central Secretariat, Chennai, June 1-2, 1998.

WS-7 International Workshop on **Technological Upgradation in Food Processing Leather, Pulp and Paper,** Mashad, Islamic Republic of Iran, June 14-18, 1998.

WS-8 TCDC International Workshop on **Surface Engineering and Coatings** NAL, Bangalore, June 25-30, 1998.

WS-9 TCDC Workshop on **Herbal Drugs and Aromatic Plants** Kathmandu, Nepal, October 7-9, 1998.

WS-10 TCDC Workshop cum Training Programme on **Food Processing for Value-Addition, Health Care and Nutrition,** CFTRI, Mysore, October 22-24, 1998.

WS-11 International Workshop cum Training Programme on **Landslide Hazard and Risk Assessment and Damage Control for Sustainable Development,** CRRI, New Delhi, November 6-15, 1998.

WS-12 TCDC International Training Workshop on **Emerging Trends in the Diagnosis of Infectious Diseases,** CDRI, Lucknow, December 7-12, 1998.

WS-13 TCDC International Workshop on **Management of Innovation from Concept to Commercialisation,** IPFT, Gurgaon, December 21-24, 1998.

WS-14 International Consultation Meeting on **Technology and Environmental Upgradation in Indian Leather Sector,** India Habitat Centre, November 29-30, 1999.

WS-15 International Workshop on **Technological Upgradation of Drugs, Pharmaceuticals & Agro-chemical Industries** for Global Competitiveness, IICT, Hyderabad, November 30-December 4, 1999.

WS-16 International Seminar on **Environmental and Waste Management in Iron and Steel Industries**
National Metallurgical Laboratory, Jamshedpur, December 2-3, 1999.

WS-17 TCDC Workshop on **Natural Disaster Reduction: Policy Issues and Strategies**
Structural Engineering Research Centre, Madras, December 21-22, 1999.

WS-18 International Workshop on **Sustainable Strategy for Promoting Export Competitiveness in Knitwear Industry,** Tirupur, August 23-25, 2000

The above evaluation revealed the maximum score of 69 out of 80, for three of the eighteen workshops, with several others in league of the maximum rating. The guiding average was thus between 62 and 63.

(B) Rating of Operational Efficiency

Planning and design of individual events such as workshops, quality deliberations at the national level steering committee, quality deliberations at the local level, organizing committee consultations with subject experts and stakeholders, quality of database on experts, rigorousness of the selection of expert consultants etc. count towards operational competence.

SN	Success indicator	WS 1	WS 2	WS 3	WS 4	WS 5	WS 6	WS 7	WS 8	WS 9	WS 10	WS 11	WS 12	WS 13	WS 14	WS 15	WS 16	WS 17	WS 18
1	Demand from beneficiaries	8	8	8	8	9	9	9	9	8	8	8	8	8	9	9	8	9	9
2	Rigor of matchmak-ing between expertise required and expertise identified	8	8	9	9	9	8	9	9	9	8	9	8	9	9	9	9	8	8
3	Rigor of selection process and decision making	8	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	9
4	Speed and quality of interfacing among all other players	8	9	8	8	8	8	8	9	8	9	9	8	8	8	8	9	8	7
5	National standing of the host organization	8	8	9	8	9	9	8	9	8	8	9	9	7	9	9	9	9	7
6	Quality and number of beneficiaries	8	9	9	8	8	8	8	9	8	8	8	8	8	9	9	8	8	8
7	Quality of interaction between stakeholders	7	8	9	8	8	8	8	9	8	8	8	8	8	8	8	8	8	7
8	Quality and timeliness of preparatory meetings, reporting	7	7	9	8	8	9	8	9	8	8	8	9	7	9	9	9	8	8
9	Total	62	65	70	66	68	68	67	72	66	66	68	67	64	70	70	69	66	63

The above evaluation revealed maximum score of 72 out of 80,with three other workshops trailing at 70. The guiding average was thus 67.

(C) Rating of Impact of the Activity

This covers short- and long-term impact of the Workshops like immediate capacity building at local, regional or national level; emergence of new initiatives, opportunities, infrastructure; preparation of guidelines and twinning arrangements between institutions.

SN	Success indicator	WS 1	WS 2	WS 3	WS 4	WS 5	WS 6	WS 7	WS 8	WS 9	WS 10	WS 11	WS 12	WS 13	WS 14	WS 15	WS 16	WS 17	WS 18
1	Stimulus to national develop-ment	8	9	9	9	9	9	9	9	9	9	8	9	7	9	8	8	9	7
2	New avenues/ lead for R&D & industrial develop-ment	7	9	9	9	9	9	8	9	8	8	8	8	7	9	9	9	8	8
3	Sustainabi-lity through institutiona-lization of the activity	NA	NA	NA	10	NA	NA	NA	NA	10	NA	10	NA	NA	NA	NA	10	NA	NA
4	Capacity building	5	9	8	9	8	8	8	8	8	8	7	9	8	9	8	8	9	9
5	Trouble shooting from industries	NA	8	9	7	7	8	7	7	7	7	7	7	NA	7	8	7	9	9
6	Bilateral and multilateral linkages/ MOUs	8	9	8	9	7	7	8	7	7	8	8	8	7	8	8	9	8	7
7	Access to information not available	8	8	9	7	8	9	7	9	9	7	9	9	9	8	8	9	8	8
8	Identified wasteful national effort in R&D	7	7	9	8	7	9	9	8	9	8	9	9	9	9	9	9	8	8
9	Total	43	59	61	68	55	59	56	57	67	55	66	59	47	59	59	69	59	56

The judgment on this indicator was the toughest. The above evaluation revealed maximum score of 69 out of 80 and minimum of 43. The guiding average was thus 58

(D) Fulfillment of Administrative Requirements

Timely organization of meetings, coordination of activities, adherence to administrative procedures and rules, financial management is the other organizational requirements to be assessed.

SN	Success indicator	WS 1	WS 2	WS 3	WS 4	WS 5	WS 6	WS 7	WS 8	WS 9	WS 10	WS 11	WS 12	WS 13	WS 14	WS 15	WS 16	WS 17	WS 18
1	Selection of activity and identification of experts as per guidelines	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
2	PPC meetings appropriate-ly timed and conducted	8	9	9	8	8	9	8	8	8	9	9	9	8	8	8	8	8	8
3	PSC meetings appropriate-ly timed and conducted	8	9	9	8	9	9	8	8	9	9	8	8	8	8	8	8	8	8
4	HPC meetings appropriate-ly timed and conducted	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
5	Organizing Committee meetings appropriate-ly timed and conducted	8	8	8	8	8	9	9	9	9	8	9	8	7	8	8	9	9	8
6	Utilization of budget	8	8	9	9	8	8	8	7	9	9	9	8	8	9	8	8	9	9
7	TPR meetings appropriate-ly timed and conducted	9	8	9	9	8	8	9	9	8	8	8	8	8	9	9	9	8	9
8	Activity report of the NPC transmitted to all parties on time	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
9	Total	67	69	71	69	68	70	69	68	70	70	70	68	66	69	68	69	69	69

The above evaluation revealed maximum score of 71 out of 80, with several others in league of the maximum rating. The guiding average was thus 68.

The above data could be rearranged as follows:

Consideration	WS 1	WS 2	WS 3	WS 4	WS 5	WS 6	WS 7	WS 8	WS 9	WS 10	WS 11	WS 12	WS 13	WS 14	WS 15	WS 16	WS 17	WS 18
A	69	64	68	63	65	57	50	69	55	59	64	64	62	68	69	66	67	47
B	62	65	70	66	68	68	67	72	66	66	68	67	64	70	70	69	66	63
C	43	59	61	68	55	59	56	57	67	55	66	59	47	59	59	69	59	56
D	67	69	71	69	68	70	69	68	70	70	70	68	66	69	68	69	69	69

Collectively, the guiding averages for the four considerations were as follows:

Consideration	Guiding Score
(A) Planning and implementation	63
(B) Cumulative operational efficiency	67
(C) Cumulative impact of various activities	58
(D) Fulfillment of administrative requirements	68

The next question that surfaced was the relative weightage of the above four considerations. It was a consensus view to accord 60 % weightage to (C) impact, 15% each to (A) planning and (B) efficiency and 10% to (D) the administrative requirements. The overall guiding average therefore worked out to be 61, acquiring 76% rating. The degree of success of the TOKTEN project based on the scale proposed was "**High**".

If the spin-offs like creation of databases, preparation of manuals on trainer potential in India, setting of new facilities, donation of equipment and software, on the spot trouble shooting, opening of doors for the meritorious and eventual outcome of new leads got incorporated in to the analyses, the rating thus shooted up to the highest mark.

8.7. Limitations of the Method

The practical application of the approach entailed mapping of the perceptions of a very large number of people differing in imagination, perceptions, positions, experiences, education, attitude, etc. This introduced wide variations in the responses. Often the views expressed were too personal or formed the point of view of the organization, whereas these should been purely technical and matured in nature. Such aberrations often discouraged undertaking of a sophisticated exercise.

The questionnaire did not go beyond the stated objectives of TOKTEN. It did not pose questions on the probable scenarios of TOKTEN if it were to be revived, due to developments in ICT, seamless networking of laboratories, problems of technological obsolescence, erosion of public R&D and accountability, besides the nagging questions, viz. absence of focus, weak linkages and strategy for sustainability and also suggestions on reforms required, improved management structure, self-propelling mechanism and the required changes in the existing concept of TOKTEN, if any.

Chapter 9

Summary and Conclusions

The Transfer of Knowledge through Expatriate Nationals (TOKTEN) aims at mobilizing scientific and technical services of expatriate nationals to work for short periods in their country of origin to support the countries development process. The UNDP in Turkey first initiated it, in 1976. It is functioning in over 30 developing countries, namely, China, Egypt, Iran, Liberia, Philippines, Ukraine and Vietnam.

The TOKTEN was started in India in March 1980 as a joint programme of the GOI and the UNDP and continued up to mid-2001. Under the programme, 470 visits of expert consultants (66 revisits) including ten top class women scientists worked in more than 250 Indian organizations covering a very wide spectrum of the S&T. R&D Institutions, industries in public and private sectors, academic institutions and Government organizations were the chief beneficiaries. The benefits mainly permeated in to the fields of physical, biological, medical and engineering sciences and technologies. The areas covered included alternative power resources, architecture, biotechnology, industrial hygiene and safety, machine and tool design, microelectronics, polymer chemistry, remote sensing, telecommunication and development of water resources. A total of about 30000 man-days of overseas training and about 50000 man-days of training in India were achieved.

There was enough scattered evidences to suggest that TOKTEN did meet its objective of upgrading the level of S&T in India, besides promoting applications of S&T and its commercialization, enhancing industrial productivity through advanced technological know-how, Improving quality of goods and services particularly of SMEs thereby contributing to sustainable human development. In the process a large number of Indian scientists got trained in advanced techniques. The thesis exchanges notes

with other countries like Turkey, China, Vietnam, Egypt and Palestine in order to compare and contrast planning and design, implementational modalities, operational features, monitoring mechanisms, diversifications etc. The replicability of Chinese and Israeli models in the Indian context is indicated.

The understanding is extended through a Questionnaire survey of NRI consultants and the user community with spotlight on factors such as national affinity, cultural sensitivity, brain gain, consultancy mode, and tacitness of transfer of knowledge. Published and unpublished information, internal reports and files, interviews and group discussion with people who knew TOKTEN added immensely to the substance of the thesis.

TOKTEN was hailed as successful based on periodic reviews in specific contexts. Like other countries India also followed periodic Tripartite Project Review, mid-term and terminal review; either by UNDP itself or through independent missions appointed by the UNDP. Besides, the feedback from the expert consultants and the hosts often helped in achieving a balanced view.

The TOKTEN-India programme was reviewed thrice by independent missions constituted by the UNDP, for the periods 1980-87, 1987-90 and 1990-95. The first evaluation lay emphasis on tackling specific problems in R&D projects and on development of collaborative projects, besides encouraging training of researchers in new techniques and transfer of knowledge through workshops and seminars. The second evaluation recommended establishment of comprehensive database for identification of experts and to have a methodology of continued interaction with the consultants for lasting benefits. The third evaluation mission recommended tuning the programme to the national development priorities, change of gear from `supply push' to `demand pull', and it mooted the visionary Umbrella concept(1996) that led to the unification of TOKTEN (1980), UNISTAR (1985) and TCDC (1973) components. Consideration of sustainability was brought to the centre stage.
The prominent features of the Umbrella Project were:

- Unification of the concepts of TOKTEN, TCDC and UNISTAR towards higher orders of synergy through development of a demand driven integrated approach.
- Operation of the programme in the 'Project mode', with well-defined expected results and deliverables to generate focus and impact.
- Following a consortium approach involving R&D, industry and nodal organizations.
- Developing greater orientation towards application with industrial bias.
- Creating a closer alignment with the national priorities of India.

With TOKTEN, UNISTAR and TCDC resonating in unison, results clearly demonstrated higher impact because of synergy. Eighteen international workshops and seminars held in high priority areas with the interactive participation of TOKTEN, TCDC and UNISTAR experts yielded a huge dividends. The thesis takes a detailed look at every facet of the various activities to put the outputs of the Umbrella Project in their true perspective. Gains of the project, both tangible and intangible are documented and analysed.

Despite very positive vibrations created by the project, a decision was taken to discontinue it perhaps on the ground that it could not become self-sustaining in two decades of its operation in India. Available financial resources being extremely limited, TOKTEN failed to compete with some of the high profile proposals in glamorous areas.

Appreciating the fact that regardless of what happens to TOKTEN, India will continue to tap the expertise of expatriate nationals, it was important to sum up the gains of TOKTEN. There were no serious attempts to do so either in India or in other countries of the world where TOKTEN was operational. Even if one wanted to gauge the degree of success met by TOKTEN, neither any user-friendly approach nor a consolidated picture of the outputs was available. The author got motivated by the great value of undertaking such a task, which carried weight of history and wings of future.

India deals with dozens of multilateral and bilateral cooperation in S&T but hardly any one of these are systematically gauged in terms of their degree of success. The literature on the measurement of success of projects in general and bilateral and multilateral collaborative projects in particular, is thus reviewed. The approaches followed in the evaluation of programmes by international funding agencies like the EC, DANIDA, CIDA are summarized and their adaptability for evaluation of TOKTEN are given.

The thesis climaxes in to cataloging of indicators of success and suggests a user-friendly approach to gauge success of the erstwhile TOKTEN, which was implemented as a stand-alone operation as well to gauge the success of the more complex TOKTEN Umbrella programme. The complexity came from the micro dimension of individual activities and the macro dimension of the holistic output. The task became harder because the three components TOKTEN, TCDC and UNISTAR were expected to vibrate in resonance concurrently, while walking along their separate routes. Putting a price tag on outputs of larger incubation time, valuable byproducts and spin offs, and on institutionalized activities threw additional challenges.

The suggested approach was applied to the outputs of the Umbrella programme both at micro and macro levels. In the thesis, a two-step approach has been used. In the first step, the degree of success of every isolated activity is quantitatively judged by giving numeric weightage to indicators of success such as (a) rating of activity planning (b) rating of operational efficiency (c) rating of impact of the activity and (d) fulfillment of administrative requirements. In the second step, the very criteria are retrained to achieve a composite quantitative assessment of degree of success. The conclusion that the degree of success of the TOKTEN Umbrella Project was high was vindicated by the analyses of feedback received from a large cross section of experts, host organizations and other beneficiaries.

The suggested approach clearly stands out as more logical and less subjective when compared with random approaches usually followed when information is inadequate and a systematic approach is unavailable. This objective assessment, it is believed, should serve as an invaluable input when a "New TOKTEN" is born.

9.1. Specific Conclusions

The in-depth study of the two-decades long history of TOKTEN , questionnaire surveys, interviews, group discussions and published as well as unpublished information leads to the conclusion that:

- The concept of TOKTEN Umbrella project is basically sound and is applicable to this day. Spotlight on key focus areas was a move of great vision and the stipulated areas remain valid even today, with the provision of fine-tuning, as it exists. Insistence on demand-based decision-making is wise too.

- There is much scope for improving synergy between TOKTEN, TCDC and UNISTAR and there is a strong case to maximize quality by pooling resources and leveraging capacities. The respondents feel that now the focus should be on seeking technical advice from the NRIs in the upcoming areas of technological breakthroughs.

- The contribution of TOKTEN to India's strategic and economic sectors, during the period of Umbrella Project is very low. Hence any new version of TOKTEN should be re-oriented to serve these needs.

- Institutional capacity building and modernization to keep pace with the rapidly changing technological landscape will assume even higher importance. The emphasis on capacity building activities should not be diluted (due to shift in priority of UNDP) but enhanced (through GOI funding).

- The selection of consultants has been rigorous during the life of the TOKTEN Umbrella project. Greater care is however necessary in updating databases and matching the demand with various supply options. The success of project at micro-level assignment indeed depends on matching of the expertise of consultant and the requirements of host. Here the matching of expertise of consultant available and the actual requirement by the executive agencies and also matching of levels of knowledge of individual 'consultant' (transferor) and the 'recipient' (transferee) are critical for success of the assignment. Where possible, the selection must be based on past performance of the consultant in India.

- A prior interactive dialogue between the user agency and the selected consultant in cyber space is pre requisite to success. This should become a routine part of the preparatory groundwork while finalizing action plan.

- An Overseas Advisory Panel of NRIs covering the different areas of priority may be constituted to work closely with the implementing agency. Idea of opening TOKTEN local chapters needs exploring.

- The degree of success of knowledge transfer is directly proportional to the processing capability of the recipient, in terms of extent of utilization of knowledge. Consequently, certain 'enabling conditions' like a minimal level of capacity is essential for success.

- Success of project depends on the clarity in defining the objective of the visit of the consultant and his/her terms of reference. This requires sharpening the mechanism for determining the demand. This in turn should be rooted in identification of mission-oriented assignments.

9.2. General Conclusions

A questionnaire survey on the basic premises of the TOKTEN-India Project, its implementation and impact was carried out. Following are the major findings of the Survey.

- Cultural homogeneity helped in effective consultancies. While the NRIs wholly accepted this feeling, the Indians had a different perspective. They felt that English being the language of communication it did not matter whether the consultant is an NRI or not so long as the visit is found beneficial.

- The Indians accepted 'Brain gain' and feel that continued support of NRIs will be necessary in the frontline areas where NRIs excel. The NRIs also feel that the kind of exposure they have and the research facilities abroad keeps them ahead in S&T.

- Face to face interactions are absolutely essential, particularly for tacit transfer of knowledge. Hence TOKTEN cannot compromise on travel and dispense with personal visits.

- The primary advantage of visit of an expert to an institute is that a group of scientists can take advantage, in line with the aim of the scheme. The NRIs found strong team spirit among the Indian scientists. However the sustenance of contact has been poor, on both the side.

- There was need for adequate 'pre consultancy' and 'post consultancy' activities to derive the best mileage out of the consultancy.

- Multiple demands on a consultant's time could be frustrating and not so useful for the project. The consultant should therefore spend adequate time with the principal host. However, sharing of the visit among main host and other user community is not to be dissuaded either.

- As expressed by the consultants, professional interests outweighed personal interests in their visits. However, the Indian counterparts did indicate, though indirectly, that such programme runs into rough weather when the visits tend to be more for personal reasons.

- With reference to the identification of experts, 'demand pull' was found better as against the initial approach of 'supply push' of experts.

- The synergy of three components in the Umbrella Project enabled arrangement of more number of resource persons, than had these three components been viewed apart. In the seventeen international TCDC workshops held under the Umbrella Project, 33 experts were invited as resource persons under TOKTEN, 154 under TCDC and 30 under UNISTAR for the workshops. Thus, this unified approach imparted a synergetic affect on the Umbrella events.

- Although the TOKTEN Umbrella Project was periodically reviewed by the CSIR, UND and the DEA (GOI); the Tripartite Review should have had representatives from the beneficiaries like the Universities, Industries and R&D institutions. Association of the consortium partners like the APCTT, DST, DBT; the industrial associations like the CII and FICCI should be encouraged

- The present study recognized the enlarged need of considering the perceived interests of all the players in the project. A common platform is envisaged on which the assessment could be done by the multiple players by way of (A) Rating of activity planning and implementation (B) Rating of operational efficiency, (C) Rating of impact of the activity and (D) Fulfillment of administrative requirements.

- It is possible to arrive at a more vibrant composite index of success, through a systematic, transparent and user-friendly process of quantification by extending the approach outlined in the thesis.

- The strength of the matrix framework lies in its generalizability. Depending on the objective, the individual elements that determine success may vary but the broad framework could remain the same. Even though the matrix entails subjective opinion on the significance of success, the proposed basic framework is objective. In fact, there is scope to improve the success rate of the Project, through appropriate utilization of the feedback of the players.

- Besides recognizing the perceptions of all the players, it is recommended that a consensus mechanism on the assessment need to be built-in and arrived at while judging the overall success or failure of the project.

9.3. Further Scope of Research

In the practical application of the framework, the project is viewed holistically as well as at the level of individual events of the Project. Scope exists for further study covering quality of expertise, quality of Institution and audience, transfer of advanced skill, demonstration of new technique, joint project implementation, sustenance of contact, benefit to single person or group, supply of research materials/samples, transfer of lab process and protocol, partnership credit etc.

The attributes of consultants, indicated in Chapter 7, Figure 6, may be gone into further to identify additional attributes that have a bearing on the success of the project. These could be proven record (intellectual capability, domain knowledge, successful assignments handled), presentation skill (an expert should be in a position to provide help at a level easily understood by the client through diagrams, pictures, drawings, and graphs), attitude towards a client (respect for the recipients ability, background, knowledge), ability to provide solutions under prevalent conditions (a very important requirement especially when the consultant tries to suggest methods which are successful in western world, without appropriate modification to suit the client) and scholarship/recognition.

Future scope for research could therefore be to exhaustively identify the attributes by studying the cases in the TOKTEN programme and by gathering the facts and actual perceptions of expert consultants and the hosts about the attributes. The indicators may be further made use of by delineating those conducive to managerial interventions and improvement of the Project.

Keeping in view the objective of TOKTEN to be to transfer knowledge to their country of origin, the examination of the case studies revealed that the benefits accrued may also be visualized, from yet another new dimension, as to an individual, group, institution/industry and/or nation. The degree of success of TOKTEN Project could therefore be additionally judged by relating the outcome of the visit of the consultant to the above groupings as seen through the eyes of the expert consultants and/or the recipient organisations, using suitable yardstick.

With reference to the Umbrella Project, the potentials of the three components, namely TOKTEN, TCDC and UNISTAR need to be unleashed fully and developed independently as well as collectively. Further scope exists in the establishment of knowledge centers in areas of potential interest to India. Subjects like Information technology; Biotechnology, Nanotechnology and Communicable diseases (AIDS, TB) are going to assume even higher importance.

With regard to TCDC, the major challenge is to overcome inertia and lift up the level of cooperation from the present routine programme to the above areas. This calls for taking stock of the present status of TCDC and the level of S&T in the developing countries. Boosting the potential of TCDC will help the developing countries to come closer and achieve upgradation themselves and can help in overcoming the digital divide. Further research could come out with a white paper on a new TCDC programme.

Of the three components of TOKTEN, the utilization of UNISTAR has been below its optimal, as may be seen in Table 7. There appears to be impediment of some kind that prevents them from taking advantage of the

offered help. May be that the consultants were rather too theoretical. Perhaps it needs closer involvement of user Industries in selection of consultants. This requires a separate study. How best to take advantage of the UNISTAR programme in the industrial development of India and the developing countries could therefore be yet another useful direction of future research.

With the changing time, the TOKTEN geared itself to the new requirements and demands like shift of emphasis from R&D to industrial consultancy, change over from 'supply push' to 'demand pull' of beneficiaries. Today the developments in ICT and importance of Knowledge Intensive Business Service (KIBS) have opened up new vistas for further improved modalities in the implementation of TOKTEN, for maximum impact. The study shows that there is scope to plan a "New TOKTEN" having improved networking and also changed approach for evaluation of the Project.

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Appendix 1

A Questionnaire Survey on the TOKTEN Concept (Expert Consultant)

QUESTIONNAIRE

The present study is a part of the dissertation on the assumptions, implementation and impacts of TOKTEN programme under the GOI and UNDP joint venture.

Even though the answers requested may be as 'Yes' or 'No', where possible, supportive information is highly desirable.

A) Assumptions of TOKTEN

I) **Cultural similarity**: The objective is to find out if the cultural similarity of non-resident Indian (NRI) is of any special advantage.

a) During your assignment in India as a part of TOKTEN programme, did you find it easier to communicate & understand the Indian counterpart because of your cultural background? Yes No

b) Did you experience a special desire to help the Indian host/users because of cultural affinity? Yes No

II) **Brain gain**: The purpose is to know if there was knowledge transfer in real terms.

a) Did you find yourself better equipped with knowledge because of your work exposure abroad? Yes No

b) How was the receptivity of information you transferred? Were the recipients enabled/trained to troubleshoot themselves?

c) Would you have recommended a resident Indian consultant for the same purpose? Yes No

d) Do you think TOKTEN-India implemented at that time was a good idea, considering the need of the country?

e) Considering the scientific and technological progress in India, would you recommend TOKTEN for India now?

III) **Consultancy mode**: TOKTEN programme operated as short-term consultancy service. We want to find out what special advantage did this mode of transfer of knowledge or technology carried.

a) Were there any intellectual property issue involved in the consultancy that you offered? Yes No

b) Did you find any shortcoming* in the consultancy mode of transfer?

Yes No

* Logistical and equipment requirements, clarity of the work requirements on the part of the recipient, monetary compensation, administrative / secretarial support during the period of consultancy

IV) **Tacitness**:This is to know the embodiment of knowledge in the person and the necessity of physical presence for the consultancy.

a) Do you think that your physical presence was necessary to render the consultancy? Yes No

b) In view of developments in communication and internet technologies, for the kind of assignment you did under the TOKTEN programme, can the travel of consultants be reduced/avoided?

B) Implementation

I) **Demand-driven**: The TOKTEN-India programme underwent certain strategic changes. In the initial phase the programme was supply driven, with lists of consultants circulated to elicit the user demands. Later, this strategy was changed to demand driven one, with users identifying the consultants and their experiences. How do you describe your experience in matching your expertise with the recipients' need? Was it supply driven or demand driven? Which method do you think is better and why?

II) Identification of Expert

a) Did the problem posed by the user match your expertise?

b) Did you think your expertise was utilized well during the visit?

III) Time factor

a) Were the arrangements for your visit handled efficiently by the national implementing agency CSIR, India?
Yes No

b) Was the duration provided for consultation adequate? Yes No

IV) Pre-consultancy activity

a) Were you fully informed about your role, travel plan, contact addresses arrangements etc prior to your visit? Yes No

b) Did you have an opportunity to communicate with the user researcher /scientist before you traveled to India? If so, what kind of specific requirements that you communicated to each other?

c) Were all the preparations made in advance by the host institution? (Please indicate the kind of preparations required)

d) In choosing to visit India under TOKTEN programme, some of your personal interests may have matched with professional interests of undertaking this consultancy. Looking in retrospection, how much do you think your professional interests outweighed your personal interests in undertaking this visit?

e) Given the total time that you may have spent in India during this visit how much time do you think you must have spent on personal visits/ purposes? (roughly in percentage time)

V) Consultancy

a) Is the concept of main host followed by additional visits of consultants to other users uniformly effective or is it that the additional visits dilute the overall purpose of assignment?

b) Did you notice team spirit among the recipients, during your assignment?

c) Was there scope/need to pursue with the assignment for future interaction?
Yes No

VI) Valuation of consultancy

If you were to provide the consultancy, not under the TOKTEN-India programme, how much consultancy fee would you have charged at that time?

Appendix 2

NRI Respondents

SN.	Name Educational qualifications and Specialization (Identified Priority Area)	Professional Experience, Publication & Awards
1.	**Dr. Deepak G. Bhat** **6958 Wembley Circle, Centerville, USA** Ph.D., M.Tech. ➢ New surface modification techniques ➢ Hard coating technologies for cutting tools and tribilogical applications (High performance construction and special materials)	➢ 20 years Industrial R&D ➢ Sr. Res. Scientist and Engineering Manager, Valenite, Inc., Madison Heights, Michigan (13 years) ➢ Principal Process Engineer, San Fernando Labs., California ➢ Visiting Lecturer, Dept. of Physics, Univ. of Pune & College of Engg., Pune Papers: 50 Patents: 8 (US-7, Canadian-1) ➢ Chaired Technical Conferences and Symposia ➢ Co-chaired the International Conferences on Surface Modification Technologies under the auspices of the Metallurgical Society of AIME ➢ Member of delegation for evaluation of hard coating technologies at Inst. Of Superhard Materials of the Ukrainian Academy of Science in Kiev ➢ Consultant to many Cos. In US, Canada, India and other countries
2.	**Dr. Awtar Krishan Ganju** **Univ. of Miami Hospital & Clinics, Florida, USA** **October 11, 1937** Ph.D. (Anatomy) Canada, Ph.D. (Zoology) Panjab University ➢ Experimental Chemotherapy ➢ Analytical Cytology ➢ Laser Flow Cytometry ➢ Tumour Cell markers ➢ Tumour Cell Drug Resistance (Intersectoral niche area-Health)	➢ 1994-Present Professor & Director, Division of Experimental Therapeutics, Dept. of Radiation Oncology, University of Miami Medical School ➢ 1994-1998 Associate Director, Sylvester Comprehensive Cancer Center, Chief, Division of Experimental Therapeutics, Professor Radiation Oncology, University of Miami Medical School, Miami, Florida ➢ 1993-1994 Scientific Director, Michigan Cancer Foundation, Associate Director, MLPCCD Comprehensive Cancer Center, Wayne State University, Detroit, Michigan ➢ 1988-1993 Associate Director for Lab. Res., Sylvester Comprehensive Cancer Center, University of Miami Medical School, Miami Papers: 127 ➢ 1987 Chairman, Pharmacodynamics Study Section, National Aeronautics and Space Administration, Space Inflight Cytometry Project ➢ Chairman (1985-88) and Member, National Institute of Health Experimental Therapeutics Study Section ➢ 1988 Member Flow Cytometry Committee, South West Oncology Group (SWOG)

		➢ 1982-85 Member Chemosensitivity Committee (SECSG) ➢ 1985 Member Scientific Advisory Committee, (GITSG) ➢ 1988 Member, External Advisory Committee, University of Michigan Cancer Center, Ann Arbor ➢ 1988 Chairman, NAS Pharmacodynamics Study Group
3.	**Prof. Ahmedunny Therwath** **Laboratoire d'On cologie Moleculaire** **Universite Paris VII-Denis Diderot** **Paris** D.Sc, Ph.D., MD ➢ Molecular virology ➢ Molecular genetics of human cell transformation ➢ Tumor suppression genes in relation to breast tumorigenesis (Application of Biotechnology in Health)	➢ 1987-Present Professor, Molecular Virology, University of Paris, France ➢ 1983-1986 Senior Scientist, the National Institute for Medical research Laboratory (INSERM) ➢ 1981-1982 EMBO Fellow, Heidelberg, Sweden ➢ 1980-1981 Sr. Scientis, CNRS, France ➢ 1976-80 Scientist, CNRS, France ➢ 1974-1976 Research Fellow Jacques Monod Institute, Paris ➢ 1971-1974 Research Associate Dept. of Molecular Biology, Swiss Institute for Experimental Cancer Research ➢ 1970-1971 Scientist, Cancer Research Institute, Parel, Mumbai Papers: 52 ➢ Reviewer for several International Journals such as Cancer Research, Internal Journal of Cancer, International journal of Oncology, Journal of Cellur & Molecular Biology, EMBO Journal, Gene ➢ Membership • American Association for Cancer Research (AACR0 • American Society of Microbiologists • International Apoptosis Group
4.	**Dr. Govinda S Visvesvara** **National Centre for Infectious diseases** **Centers for Disease Control and Prevention** **4770 Buford Highway NE, Atlant, GA 30341-3724** **USA** Ph.D. (Photozoology, Zoology) University of California M.Sc. (Zoology) Nagpur ➢ Protozoology ➢ Microbiology (Application of Biotechnology in Health)	➢ 1982-1988 Adjunct Associate Professor, University of North Carolina ➢ 1977-Present Research Microbiologist, Centre for Disease Control, Atlanta, Georgia ➢ 1972-Present Lecturer, CDC Training Activity ➢ 1972-1976 Visiting Associate, Centres for Disease Control ➢ 1970-1972 Teaching Assistant/Associate, University of California, Berkeley ➢ 1968-1970 Research Assistant, Naval Biological Laboratory and Department of Zoology, University California, Berkeley ➢ 1963-1967 Junior Scientific Officer, Defence Research Lab., Gwalior, India ➢ 1961-1963 Research Assistant, Central Public Health Engineering Research Institute, India ➢ 1956-1961 Lecturer in Zoology, D.H.S.K. College, Dibrugarh, Assam, India Papers: 100 +; Presentations: 21

		➢ Fulbright Travel Grant, 1967 ➢ Smith-Mundt U.S. Government Scholarship, 1967 – 1968 ➢ Scholarship Award, University of California, Berkeley, 1968 ➢ Membership • Society of Photozoologists • American Society of Parasitologists • American Society for Microbiology
5.	**Dr. Saran A Narang** **National Research Council** **Institute of Biological Sciences, Ottawa** **Canada K1A OR6** Ph.D. Calcutta University ➢ Phase Display Technology ➢ Protein Engineering ➢ Dev. of Diagnostic Kits for Tropical diseases (Application of Biotechnology in Health)	➢ 1981-Present Principal Research Officer, NRC, Canada ➢ 1981-1983 Adjunct Professor, The John Hopkins University, USA ➢ 1973-1982 Senior Research Officer, National Res Council of Canada ➢ 1967-1973 Associate Research Officer, National Res Council of Canada ➢ 1966-1967 Assistant Research Officer, National Res. Council of Canada Papers: 150 Patents: 18 ➢ 'India Rattan', Award, 1995 ➢ 125th Anniversary of Canadian Confederation Silver Medal, 1993 ➢ Rice-Belanger Lectureship Award, 1990 ➢ Awarded D.Sc (Honoris causa) from Carleton University, 1985 ➢ Awarded the Johns Hopkins Scholar Medal, 1979 ➢ Recipient of the Ottawa Biological and Biochemical Society Award, 1979 ➢ Recipient of Coochibihar Professorship Memorial Award, The Indian Association for the Cultivation of Sciences, Culcutta, India ➢ Member of the Panel of Scientific Advisors, UNIDO ➢ Fellow of the Royal Society of Canada ➢ Fellow of the Johns Hopkins Society of Scholars
6.	**Dr. Suraj P. Bhat** **Jules Stein Eye Institute, BH 623** **Geffen Sch of Medicine** **Los Angeles, CA- 90095-7000** **USA** Ph.D., M.Sc., B.Sc. ➢ Molecular Biology ➢ Molecular Genetics of the Dev. of Visual Systems ➢ Recombinant DNA Technologies (Application of Biotechnology in Health)	➢ 1991-Present Associate Professor of Ophthalmology, University of California, USA ➢ 1985-1991 Assistant professor, University of California, USA ➢ 1983-1984 Associate Prof. Scientist & Principal Investigator, Columbia Univ., USA ➢ 1980-1983 Senior Staff Associate and Principal Investigator, Columbia Univ. USA ➢ 1977-1980 Visiting Fellow, National Institutes of Health, Maryland, USA ➢ 1975-1977 Postdoctoral Fellow, Hunter College of CUNY, USA ➢ 1974-1975 Project Assistant, Indian Institute of Science, Bangalore, India ➢ 1969-1974 Research Student, Indian Institute of Science, Bangalore, India Papers: 31

		➢ Mary Greve International Scholar Award ➢ Memberships • Medical Students Honors Thesis Committee, JSEI, UCLA Program • Doctoral Committee for the Doctor of Philosophy qualifying examination • Master Thesis Committee for Masters Thesis of Ms. Janice Cline • Doctoral Committee, Department of anatomy and Cell Biology, Graduate Program • Brain Research Institute, UCLA, and Embryology Club (Dept of Biological Chemistry), UCLA • Sigma XI Scientific Society • International Society of Development Biology • International Society of Eye Research • Association for Research in Vision and Ophthalmology • Association for Advancement of Science • Department of Ophthalmology Association, UCLA
7.	**Prof. Tapan K. Sarkar** **Deptt. of Electrical Engg. & Computer Sc., Syracuse University** **121, Link Hall, Syracuse** **New York 13244-1240** **USA** Ph.D., M.S., M.Sc. E. ➢ Electronic System Design ➢ Antenna analysis ➢ Radar System Design ➢ Operator Equation in Electromagnetics and Signal Processing (Information Technology)	➢ 1988-Present Professor, Syracuse University ➢ 1985-1987 Associate Professor, Syracuse University ➢ 1981-1985 Associate Professor, RIT ➢ 1977-1978 Research Fellow, Harvard University ➢ 1971-1976 Assistant Professor, RIT ➢ 1972-1975 Research Fellow, Syracuse University ➢ 1969-1971 Instructor, University of New Brunswick ➢ Consultant • U.S. Air Force (RADC: A FUEL and WRAFB) • Syracuse Research Corporation • Haris Corporation, H.P., Phillips Communications Systems and International Telecommunications Union (Geneva) etc. Papers: 160 Books: 8 Chapter in Books: 12 ➢ Best Solution Award, RADC Spectral Estimation Workshop ➢ Best Paper Award, IEEE, Electromagnetic Compatibility ➢ Memberships • Fellow, Institute of Electrical and Electronic Engineers • URSI, Commission A&B • Sigma Xi
8.	**Dr. Desiraju B. Rao**	➢ 1984-Present Chief, Ocean Modeling

	Chief, Marine Modeling & Analysis Branch, EMC/NCEP/NOAA **5200 Auth Rd., Room 209** **Camp Springs, MD 20746** Ph.D., M.S., M.Sc. ➢ Analytical and Numerical Methods Metrology ➢ Oceanography ➢ Geophysical Sciences (Information Technology)	Branch, NCEP/NOAA, Washington, D.C. ➢ 1981-Present Adjunct. Prof. of Meterology, University of Maryland, College Park, MD. ➢ 1980-1984 Chief, Oceans & Ice Branch, Goodard Space Flight Centre/NASA, Greenbelt, MD ➢ 1976-1980 Adjunct. Prof. of Meterology, University of Michigan, Ann. Arobor, MI ➢ 1975-1980 Head, Physical Limnology & Meterology Group, Great Lakes Environmental Research Lab/NOAA, Ann. Arobor, MI ➢ 1974-1976 Professor of Meterology and Limnology, University of Wisconsin – Milwankee, WI ➢ 1971-1974 Associate Prof. of Meterology and Limnology, University of Wisconsin – Milwankee, WI ➢ 1968-1971 Assistant Prof. of Meterology, Colorado State University, Fort Collins Co. ➢ 1965-1968 (a)PDF, NCAR, Boulder, Co (b) Research Scientist, Dept. of Energy, Mines & Resources, Canada Referred Articles: 50 Technical Reports: 50 + ➢ Memberships • Elected Fellow (1982), American Met. Soc. • American Geophysical Union • Oceanography Society (Charter) • International Water Resources Association (Charter)
9.	**Mr. Suneel N Vanikar** **Concrete Team Leader** **Federal Highway Administration** **Office Technology Applicaton,** **Highway Infrastructure Div.** **Washington DC, 20590** **USA** M.S. Civil Engineering ➢ New Concrete Technology ➢ Geotechnical Engg- Foundation Design (High performance construction and special materials)	➢ 1991-Present Concrete Team Leader (OTA) (GS-14) ➢ 1988-1991 Senior Project Manager (OTA) (GM-13): Portland Cement Concrete Technology Program expert ➢ 1987-1988 Highway Engineer (Federal Lands Program) (GM-13) Development of policy standards and guidance for functional activities and management of the Federal Land Highways Construction Program ➢ 1982-1987 Highway Engineer (Highway Operations Division/Bridge Division) (GM-13): Geotechnical Engineering Specialist with expertise in foundation design ➢ 1980-1982 Highway Engineer (eastern Federal Lands Division) Technical manager of geotechnical programs including the Cumberland Gap Tunnel Project ➢ 1977-1980 Chief Geotechnical Engineer: Supervision of geotechnical and materials activities ➢ 1970-1977 Bridge Design Engineer: Design and review of highway structures ➢ Awards • 1995-96 Excellence in Government, DOT Fellow • FHWA "DOT Fellows team" Award from

		Executive Director • 1992 "Public Official of the Year Award", American Concrete Pavement Association • 1987 FHWA Administrator's Award for Superior Achievement
10.	**Dr. Som R Soni** **Adtech Systems Research, Inc.** **1342 N. Fairfield Rd.** **Beavercreek OH 45432,** **USA** Ph.D. M.S. ➢ Mechanics of Composite Material & Structures (High performance construction and special materials)	➢ 1994-Present Chief Executive Officer, Ad Tech Systems Research Inc., Dayton, OH, USA ➢ 1983-1984 Sr. Research Scientist, Univ. of Dayton, Res. Inst. OH, USA ➢ 1981-1983 Res. Scientist, Univ. of Dayton Res. Inst., OH, USA ➢ 1980-1981 Sr. Res. Scientist, Univ. Energy Systems Inc., Dayton OH, USA ➢ 1978-1980 Sr. Post-Doctorate Res. Associate, Airforce Material Laboratory, DPAFB Ohio, USA ➢ 1973-1978 Research Scientist, Vikram Sarabhai Space Centre, Trivendrum, India Papers: 60 + Book: One ➢ Small Business Innovative Research (SBIR) Phase I & Phase II Awards ➢ Memberships • American Society for Testing Materials • Co-founder of the American Society for Composites • Sigma Xi • American Institute of Aeronautics & Astronautics
11.	**Dr. Mohan D Rao** **Associate Professor** **ME-EM Department, Michigan Tech University, 1400 Townsend Drive** **Houghton, MI 49931 USA** Ph.D., M.Sc. Mechanical Engineering ➢ Vibration, Acoustics & Noise Control ➢ Vibration Damping of Composite Materials ➢ Sound Quality in Product Design (High performance construction and special materials)	➢ 1994-Present Associate Professor, ME-EM Department, Michigan Tech University, Houghton ➢ 1996-1997 Research Engineer, Ford Motor Company, Advanced Engineering Centre, Dearborn, MI Funded Researches ➢ 1988-1994 Assistant Professor, ME-EM Department, Michigan Tech University, Houghton, MI Papers: 22 ➢ MTU Distinguished Teaching Awards (1992 & 1993) ➢ Memberships • ASME • SAE • ASEE
12.	**Dr. Nirmal K Sinha** **Institute for Aerospace Research** **National Research Council** **Ontario, Canada K1A 0R6**	➢ 1975-Present Senior Research Officer, Institute of Aerospace, National Research Council Canada, Ottawa ➢ 1972-1975 R&D Engineer, Andrew Antenna Co. Ltd., Whitby, Ontario, Canada

	Ph.D. (Reho-optics of glass) ➢ Snow & Ice Mechanics ➢ Material Science (High performance construction and special materials)	Papers: 160 (includes books & chapters) ➢ Awards • Special Awards from NSERC for Supervising Graduate Students • 1989 American Society of Mechanical Engineers (ASME) Achievement Award • 1990 NRCC President Commendations • 1991 OMAE/ASME Ten paper Award • 1993 ASME Board of Governors Award • 1996 Best Paper Award, International Committee on Non-destructive testing
13.	**Dr. P Sarma Maruvada** **High Voltage Engineering** **817, de Serigny** **Boucherville Quebec** **Canada** Ph.D., M.Sc., ME ➢ High-Voltage Engineering ➢ Electrical Engineering (High performance construction and special materials)	➢ 1998-Present Consultant, High Voltage Power Transmission & Power Systems, Electromagnetic Compatibility, Quebec, Canada ➢ 1969-1998 Manager of Research, Hydro Quebec Institute of Research (IREQ), Quebec, Canada ➢ 1961-1964 Lecturer (Elec. Engg.), Maulana Azad College of Technology, Bhopal, India ➢ 1959-1961 Senior Teaching Fellow, IIT Kharagpur, India Papers: 60 + ➢ Awards • Honorary Member of CIGRE • Member of the Order of Engineers of Quebec • Chairman of CGRE Study Committee 36 on Power System Electromagnetic Compatibility (1990-98) • Fellow of IEEE • Executive Chairman of the 1996 IEES/PES Transmission and Distribution Conference and Exposition in Los Angeles ➢ Memberships • ASM • APS • TMS • ANS • IIM • MRS-1
14.	**Dr. Suresh K Bhargava** **Royal Melbourne Institute of Technology** **Melbourne 3001, Victoria** **Australia** Ph.D., M.Sc. (Inorganic Clean) ➢ Homogeneous and Heterogeneous Catalysis ➢ IR Spectroscopy (Vibration) ➢ Air Pollution Control in Urban Areas	➢ 1998-Present ARC Professional Fellow (Industry) ➢ 1997-Present Director, Royal Melbourne Institute of Technology (RMIT), Spectroscopy Facility, Melbourne, Australia ➢ 1997-1998 Associate Professor, Department of Applied Chemistry, Royal Melbourne Institute of Technology, Melbourne, Australia ➢ 1990-1996 Sr. Lecturer/Lecturer, Department of Applied Chemistry, Royal Melbourne Institute of Technology, Melbourne, Australia ➢ 1988-1990 Senior Research Scientist, CSIRO, Division of Fuel & Coal technology, NSW

	(Process Technology)	➢ 1986-1988 Research Chemist, Research School of Earth Sciences, ANU, Canberra ➢ 1985-1986 Visiting Professor, Indian Institute of Science, Bangalore ➢ 1979-1982 Commonwelath Academic Staff Scholar, Exeter University, UK ➢ 1972-1979 Lecturer (Chemistry), Meerut University, India Papers: 85 + (including books etc.) ➢ Awards • 1972 Ist Position in MSc. (in Chem.), Meerut University • 1997 Golden West Medal of Appreciation for outstanding/innovative research • Corday-Morgan Support by the Royal ▪ Society of Chemistry, London (Twice) ▪ Prestigious CSIRO Medal for Student Research Scheme in Australia ▪ Business/Higher Education Round Table Award for Outstanding Research in Collaborative R&D ▪ ARC Professional Fellow
15.	**Dr. (Mrs.) Krishna Sapru** **Ovonic Hydrogen Systems** **2983 Waterview Drive** **Rochestr Hills MI 48309** Ph.D., M.Sc. ➢ Storage of Hydrogen ➢ Metal Hydride Batteries ➢ Application hydrogen materials in vehicles, airconditioners (Environment & Pollution Problems)	➢ 1969-1970 Research Associate, Michigan State University, East Lansing, MI, USA ➢ 1967-1968 Lecturer, Dept. of Biophysics, Punjab University, Chandigarh, India ➢ 1984-1987 Secretary, Membership Chairman and Program Chairman of the Detroit chapter of The Electrochemical Society. Chairman of the Second Annual Symposium ➢ 1987-1988 Chairman, Detroit Section of The Electrochemical Society ➢ 1985-1986 Member, Board of Directors of Michigan Professional Womens Network ➢ 1993 Session Chairman, Conference of "Prospective Hydrogen Fuel Cycles", 10th Annual Symposium of the American Vacuum Society ➢ 1986 Member of U.S. Team at the Hydrogen Industry Council's Debate of the Future of Hydrogen Technologies" ➢ 1987-1992 Technical Consultant to the Business Enterprise Development Center, Michigan ➢ 1990 Invited Speaker at the Kogakuin University, Chemical Energy Laboratory, Tokyo, Japan ➢ 1993 Present ECD representative for National Hydrogen Association
16.	**Dr. S. Venkatesan** **Ovonic Battery Company** **1707 Northwood Drive** **Troy, Michigan 48084-3702** **USA** Ph.D. Electrochemistry	➢ 1980-Present Vice President of Research and Development, Ovonic Battery Company ➢ 1979-1980 Post Doctoral Research Associate, University of Florida ➢ 1976-1979 Post Doctoral Research Fellow, University of New York ➢ 1974-1976 Post Doctoral Research Fellow, University College, Cork

	➢ Metal Hydride Batteries ➢ Zero Pollution Vehicles (Environment & Pollution Problems)	➢ 1971-1974 Research Associate City of London Polytechnic ➢ 1963-1970 Scientific Assistant, CECRI, Karaikudi, Tamilnadu, India Papers: 35 publications in referred journals ➢ Awards • Gold medal for an outstanding inventions award by All India Industries Exhibition • Memberships • American Chemical Society • American Electrochemical society • International Hydrogen Energy Institute • American Society of Safety Engineers
17.	**Dr. Yoginder P Chugh** **Professor & Director, Combustion Byproduct Recycling Consortium-Midwestern Region, 1230 Lincoln drive, Southern Illinois University Carbondale, Illinois 62901-6603 USA** Ph.D., M.S. ➢ Rock Mechanics and Ground Control ➢ Coal Combustion by-Products Management ➢ Coal Processing Waste Management ➢ Ground Control in Coal Mining and Subsidence (Environment & Pollution Problems)	➢ 1993-Present Director, Management of Dry FGD By Products in Underground Mines, Cooperative Agreement, US.S. Dept. of Energy, USA ➢ 1991-Present Director, Coal Combustion Residues Management Programme ➢ 1988-Present Director, Illinois Mining and Minerals Research Resources Institute, U.S.A. ➢ 1984-Present Prof. & Chairman, Dept. of Mining Engineering, Illinois, USA ➢ 1988-1995 Technical Director, National Land Reclamation Centre: Mid Western Region ➢ 1981-1984 Prof., Dept. of Mining Engg. ➢ 1977-1981 Acting Chairman, Dept. of Mining Engg. ➢ 1974-1977 Planning Engineer, AMAX Coal Co., USA ➢ 1971-1974 Research Engineer, IIT Research Institute, Illinois, USA Papers: 100 + ➢ Awards • Publications Board Award, Society of Mining Engineers (1982, 1983) • Other Awards including receipt of Grants, Chairman, Co-chairman, Invited Speakers, Invited Professors etc. ➢ Memberships • American Institute of Mining Engineers (1965-Present) • Illinois Mining Institute (1974-Present) • Indiana Mining Institute (1974-Present) • ASTM (1972-73) • Society for Experimental Stores Analysis (1972-73) • Sigma Xi (1970-73) • Tau Beta Pi (1989-Present) • ASME (1985-Present) • International Bureau of Strate Mechanics (1984-Present)
18.	**Dr. Bal Raj Nijhawan**	➢ 1971-Present Senior Advisor/Consultant,

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Appendix 3

A Questionnaire Survey on the TOKTEN Concept (Beneficiary)

QUESTIONNAIRE

- The aim of the exercise is to examine the basic premises of TOKTEN, its implementation and impact.
- Even though some of the answers requested are as 'Yes' or 'No', where possible, supportive information is highly desirable.

A) ASSUMPTIONS OF TOKTEN

I) **Cultural response**: The objective is to find out if the cultural similarity of non-resident Indian (NRI) consultant is of any special advantage.

a) Did you find it easier to communicate & understand the NRI consultant? Yes No

b) Was the expert forthcoming to help because of cultural affinity?
Yes No

II) **Brain gain**: The purpose is to know if there was knowledge transfer in real terms.

a) Did you find the NRI consultant better equipped with knowledge, endowed with the foreign experience?

b) Was there not a resident Indian consultant for the same purpose?
Yes No

III) **Consultancy mode**: TOKTEN programme operated as short-term consultancy service. We want to find what special advantage did this mode of transfer of knowledge or technology carried.

a) Was there any transfer of technology under the TOKTEN consultancy? If the answer is 'Yes' then did it involve IPR formalities? Kindly elaborate.

b) Did you find any shortcoming* in the consultancy mode of transfer?

Yes No

*Logistical and equipment requirements, clarity of the work requirements, monetary compensation, administrative/secretarial support during the period of consultancy.

IV) **Tacitness**: This is to know the embodiment of knowledge in the person and the necessity of physical observation of the problem.

a) Was the physical presence of the expert necessary to render the consultancy?

c) In view of developments in communication and internet technologies, for the kind of assignments under the TOKTEN programme, can the travel of consultants be reduced/avoided?

IMPLEMENTATION

I) **Demand-driven**: The TOKTEN-India programme underwent certain strategic changes. In the initial phase the programme was supply driven, with lists of consultants circulated to elicit the user demands. Later, this strategy was changed to one of demand driven one, with users identifying the consultants and their experiences. How do you describe your experience in matching your need with the required expertise? Was it supply driven or demand driven? Which method do you think is better and why?

II) Matching

The objective of this query is to know the extent to which there was matching between the knowledge you shared (transferred) and the capacity of the recipient to imbibe the knowledge.

a) Against a three-point scale of A_, A and A+ corresponding to below average (of recipient), equality (perfect match) and surplus flow of knowledge (from expert), respectively, which one you would you perceive to have been the experience, in general?

b) How do you think this matching can be improved?

III) Time factor

a) Was the consultancy provided in time? Yes No

b) Was the duration of consultancy adequate? Yes No

IV) Pre-consultancy

Were all the preparations required prior to the visit of consultant made well in advance? (Indicate a few of these preparations)

If the answer is 'No' then, was it due to failure of structural mechanism or was it due to inability to anticipate all the requirements or any other reason?

V) Consultancy

a) Is the concept of main host followed by additional visits of consultants to other users uniformly effective or is it that the additional visits dilute the overall purpose of assignment?

b) Was there collective utilization of consultant's expertise among the host/user organisations?

VI) Post-consultancy

Was there need for follow-up visit of consultants?

VII) Valuation of consultancy

TOKTEN consultants did not charge fee for their consultancy. How much could be the saving affected?

C) IMPACT/BENEFITS OF TOKTEN: We intend to find out the value addition affected by the consultancy.

a) Could you gain new foreign contacts through the NRI? Please indicate its impact, if any, on the research activities.

b) Did the expert advice help you subsequently in taking up qualitatively better projects?

c) Did the consultancy lead to visible and tangible results? Could you site concrete examples?

Appendix 4

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Appendix 5

A Relevant Extract of Survey of NRIs on the Usefulness and Improvement of the TOKTEN Programme carried out by the TOKTEN Team of ISTAD, CSIR [Bhandari, R K; 2001]

Q.1. What are your views on the utility of the TOKTEN Programme?

Responses

TOKTEN Programme was considered very useful and good programme, which provided excellent mechanism to tap the highest level of S&T in the world, through the NRI base (100 per cent). The specific replies are reproduced here:

- It was one of the best vehicles for technology transfer from the developed nations to India. It provided a platform to bring together world class experts in a given area with complementary skills, and opened a flood gate of possibilities for NRIs who were really keen to help their motherland.
- This programme opened avenues for the exchange of information between NRIs and Indian institutions (industry, academic and government).
- It provided strong links between NRIs and Indian resident scientists and engineers for mutual benefit towards achieving world level excellence in S&T.
- There should be accountability and follow-up by individuals and parties.
- A mechanism should be devised to maintain and improve contacts for long-term and to justify the visitors time to their employers.
- The specific achievements by the Indian Scientific and Industrial Community through increased scientific and technical cooperation between Indian institutions and foreign entities in the last two decades of the TOKTEN programme supported by UNDP deserved to be highlighted.

Discussion

The TOKTEN–India programme is unanimously recognized, by the respondents, to be a very useful programme. A closer look at the NRIs tapped under TOKTEN essentially belonged to the same generation, still having their roots in India. Most of them had their basic education in India. In a

compilation of 70 Biodata of NRIs, it was seen that 31 have indicated that they had their initial career in India. They would therefore have a natural desire to visit their homeland. TOKTEN programme mooted by the UNDP provided the NRIs an opportunity to make the visit "professional", as TOKTEN consultants. It therefore served their personal as well as professional interest. However there should be proper accountability between the two. This responsibility must rest with all the players. After the initial contact many experts continued exchanging scientific and technological information with the Indian counterparts. For instance, there was a programme of launching a polar satellite with a PSLV launch vehicle that was being developed by ISRO. It was agreed that close contact and liaison would be maintained during the course of SROSS-C RPA Science analysis and for future Satellite experiments, through correspondence and follow up visit.

TOKTEN programme has found acceptance in several countries due to its utility. The flexibility that could be introduced in its design and operation proved to be added advantage to produce the desired impact (Chapter 3 on the international experience of TOKTEN furnishes several examples).

Transfer of technology is generally restrictive due to its sensitivity, intellectual prowess, commercial value etc. it is therefore not easy to receive technology from the west, which are much ahead in development of advance technology. However, NRI channel was found promising in transfer of know-how and technologies from abroad. Examples of development of technologies in India with the help of the TOKTEN experts may be seen in section 4.4.

The response that the TOKTEN programme facilitated exchange of knowledge/know-how is amply borne out at section 4.3.1. Under the TOKTEN programme, efforts were specially made to locate the NRIs, compile their Directory and seek their assistance in the development of India. In the absence of TOKTEN, a large potential of NRIs would have remained untapped.

The TOKTEN consultants were expected to submit their visit report to the

CSIR's INRIST Centre. Many of these reports referred are listed under the references. Where possible, revisits of the TOKTEN experts were arranged for follow-up and completion of work undertaken, in a project mode.

A mechanism to maintain contact and enhance the utility of TOKTEN experts may be through an on-line database.

The TOKTEN programme aimed at short-term visit for trouble shooting, transfer of know-how/technology and networking. The beneficiaries were free to follow up the visit and develop long-term relationship with the TOKTEN consultant. The specific benefits derived out of the consultations were brought out by ISTAD as compendium of feedback from the organizations visited by the experts. However, so far as the publicity of TOKTEN remains, it was inadequate. The UNDP did organized international workshop on TOKTEN for the participating countries. But still it was not well known in the scientific community.

Q.2. If you feel that the TOKTEN Programme is relevant and useful, how could it be further improved both from the point of view of the potential beneficiary and the TOKTEN expert?

The **responses** revealed as follows:

- Improvement in TOKTEN programme may be brought about by finding ways for the experts to spend their stay fruitfully in India. They should be involved in major international projects, and grooming of young scientists.
- The host organization should be more specific in terms of its needs and expectations from the Consultants, prior to their visits. The two parties should begin dialogue well in advance for having meaningful gain. This would help the Consultant in deciding the course of action, including bringing of needed materials. It would speed up the learning process and would largely improve the efficiency of transfer of knowledge.
- Following measures were suggested by the respondents to ensure the follow up of the Consultant's visit to India.
  - Experts may be appointed as `Invited National Professors' for five years during which they must visit India for at least three weeks at a time.
  - A three-way partnership may be evolved between NRI-CSIR-Industry.
  - The Programme Director should have more freedom for taking decisions, minimum bureaucracy and avoidance of red tapism should be

emphasized.

- Reverse visits of Indian experts and young scientists, to the laboratory/institution of the experts, be arranged.
- Design programmes that do not terminate with the visit of the NRIs. These should include long-term bilateral research projects in specific areas.
- Other suggestions included, offering 10 expatriate nationals a five-year term of affiliation with an Indian institution and offer of other forms of recognition in return of services rendered by them.

➢ A long-term specific scientific goals would improve the interaction between potential beneficiaries and the TOKTEN experts:

- By creating an information exchange database of those who can transfer the knowledge/technology etc. and those who can use it, involving all the concerned people from academic, industry and government sectors.
- More flexible means of promoting the contact visits.

➢ Many NRIs would like to provide the benefit of their rich experience to Indian industry, university and R&D institutions, making TOKTEN programme effective.

➢ The areas where the country needs the foreign expertise should be identified, and experts in these areas should be listed. Their services should be made available to the institutions in the relevant fields.

➢ Wherever necessary, knowledge could be transferred to industry for manufacturing. This would make Indian industry more competitive and globally acceptable.

Discussion

The beneficiaries of the TOKTEN–India programme were both non-profit making bodies like the R&D institutions, Universities and profit oriented organizations like the industries, private institutions. Further measures to improve the programme for the benefit of academic research institutions, as suggested by the respondents, may be explored. NRIs may be interested to affiliate themselves with prestigious institutions like IITs and IISc. The academic institutions will have to take the initiative to facilitate the travel and stay and make the proposal mutually rewarding.

In the case of industries the programme should be closely aligned with the national priorities and need. A three-way collaboration may be modeled on public-private partnership with CSIR laboratory developing the technology in

consultation with the NRIs in focused area of interest to the industry. However, the sharing of cost between the government and the industry will have to be worked out. One way could be that the developmental cost may be borne by CSIR and the up scaling and commercialization cost may be borne by the industry.

Regarding bureaucracy, CSIR as the implementing agency carried the advantage of being an autonomous body and the National Project Director was the Director General of CSIR, whose decision was the final, cutting down bureaucracy. The National Project Coordinator was also a very senior Director level scientist of CSIR leaving no room for red tapism.

While the importance of clarity in defining the problem is underscored, it should be supported by prior preparation, timely processing and thorough planning of the actual visit of TOKTEN expert for improving the success rate of transfer of knowledge.

When the TOKTEN was conceived, only the visit of NRI was felt necessary. However now the situation is not the same. A RAND report considers India to be in the group of 24 nations termed scientifically proficient countries [Wagner, Caroline S; 2001]. They possess an overall S&T capacity index* value at or over the international average, but they are not uniformly capable as the advanced country. Hence, Indian scientists, with their intellectual prowess should also be provided to visit abroad under TOKTEN and interact with various relevant institutions and experts through the existing bilateral and multilateral programmes of CSIR.

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* It is a composite index of several components, viz, the per capita GNP, No. of scientists, engineers per million people, No. of Journal articles and patents produced, the percentage of GNP spent of R&D and No. of university and research institution.

TOKTEN has been envisaged as a short-term consultancy assignment for about two weeks. Any long-term plan would depend on the parent organization of the expert and management of budget. However, long-term arrangements for training have been achieved through special MOU or even otherwise.

TOKTEN limited its role to solving of S&T problems or transfer of know-how and has resulted in initiation of collaboration as fallout. In order to facilitate sustenance of the effort, policy level decision to reorient programme with long-term technological goal should prove beneficial. The consultants will have to be sought from multiple sources with ultimate aim to make the Indian industries globally competitive, as in the NRI response.

Appendix 6

Composition of Committees Constituted for Umbrella Project

Task Force

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New Delhi-110001

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Chairman
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Vice Chairman
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Jamshedpur-831007

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Chandigarh-160014

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Head, International Science and Technology Affairs
Directorate and National Project Coordinator
GOI-UNDP Project, CSIR
New Delhi-110001

Appendix 7

Calendar of Total Activities (Meetings & Events)

1996

January	
10	Prodoc signed between United Nations Development Programme, Department of Economic Affairs of the Government of India (DEA) & the Council of Scientific & Industrial Research. Programme Policy Committee (PPC) constituted Programme Steering Committee (PSC) constituted.
February	
19	First Meeting of PPC
20	First Meeting of PSC Constitution of a Task Force (TF) for priority setting exercise
April	
8	First meeting of the TF
25th	Second Meeting of the TF
May	
13	Third Meeting of the TF and submission of Report.
June	
5	A Brain Storming Session based on the recommendation of the Task Force Report Consideration of Annual plan by PPC & PSC
18	Approved Annual plan furnished to UNDP
July	
8	Second meeting of PPC to kick off the programme. A subcommittee of the PPC was constituted to facilitate speedy decision making between the two consecutive PPC Meetings.
August	
1	Meeting of the Subcommittee of the PPC
22	The first installment of the UNDP project funding received
30	Second meeting of PSC
November	
18	First meeting of the High Power Committee for selection of TOKTEN experts
29-1 Dec	TCDC workshop and Training Programme on Hydrogen Energy & related Technologies, Varanasi

1997

February	
3-11	Application of On-line Instrumentation in Pulp & Paper, Leather and Food Processing Industries, CEERI Centre Chennai
April	
16-18	Advances in High Performance Concrete Technologies and its Applications, SERC, Chennai

June	
18	Second Meeting of the High Power Committee for selection of TOKTEN experts
September	
1	Third meeting of PSC
18-22 Jammu	TCDC International Workshop cum Training on Herbal Drugs, RRL,
October	
13	Meeting of PPC
15-18	TCDC International Workshop on Application of Biotechnology in Biofertilizers and Biopesticides, New Delhi
December	
16	First meeting of Tripartite Review (TPR) Committee

1998

February	
27	Third meeting of the High Powered Committe for selection of TOKTEN experts
June	
1 - 2	Brainstorming on Identification of Technology Needs of SMEs in Developing Countries, Chennai
14 - 18	International Workshop on Food Processing, Leather, Pulp & Paper at Mashad, Islamic Republic of Iran in association with APCTT
15- 20	Training Workshop on Quality Control of Medicinal Aromatic Plants and their Products, RRL, Jammu
25 - 30	TCDC International Workshop on Surface Engineering & Coatings, National Aerospace Laboratories, Bangalore
1 **August**	
20	First meeting of the Committee on SMEs, Science Centre, Delhi
28	Fourth Meeting of the Programme Steering Committee (PSC)
September	
3	Fourth Meeting of the Programme Policy Committee (PPC)
October	
7 - 9	International Workshop on Herbal Drugs and Aromatic Plants, Kathmandu, in Nepal
22 - 24	TCDC Workshop on Food Processing for Value Addition, Health Care and Nutrition, Central Food Technological Research Institute, Mysore
28	Fourth meeting of the High Powered Committee for selection of TOKTEN experts

November	
6 - 9	International Workshop cum Training Programme on Landslide Hazard and Risk Assessment and Damage Control for Sustainable Development, CRRI, New Delhi
10 - 11	Training at CRRI, Delhi
12 - 15	Field Visits to Doon Valley in and around Shimla
December	
7 - 12	TCDC International Training Workshop on Emerging Trends in the Diagnosis of Infectious Diseases, Central Drug Research Institute, Lucknow
21-24	TCDC International Training Workshop on Management of Innovation from Concept to Commercialization. Standalone Activity for Countries in the broader area of Intellectual Property Management.

1999

February	
23	Fifth Meeting of the Programme Steering Committee (PSC)
March	
16	Second meeting of Tripartite Review (TPR) Committee
July	
19	Coordinators Meeting of SME Sub-sector Study
August	
5	Steering Committee Meeting of: TCDC International workshop on "Environment and Waste Management in Iron and Steel Industries" at National Metallurgicl Laboratory, Jamshedpur to be held during December 2-3, 1999 and one day Training Programme on Design of Pollution Control System for Metallurgical Industry on 4h December, 1999.
11	International Workshop on "Technological Upgradation of Drugs/Pharmaceuticals & Agro-chemical Industries for Global Competitiveness" to be held at Indian Institute of Chemical Technology, Hyderabad during November 30 - December 4, 1999.
26	Sixth Meeting of Programme Steering Committee (PSC)
September	
1	Meeting of the Steering Group on International Consultation Meeting on Upgradation of Technologies and Environmental Issues in Leather Sector, New Delhi
October	
8	Steering Committee Meeting of the Natural Disaster Reduction: Policy Issues and Strategies Workshop at SERC, Chennai.

November	
29 – 30	International Consultation Meeting on Upgradation of Technologies and Environmental Issues in Leather Sector held at New Delhi.
30 – Dec. 4	TCDC International Workshop on Technological Upgradation of Drugs/Pharmaceuticals & Agro-chemical Industries for Global Competitiveness held at IICT, Hyderabad.
December	
2 – 4	TCDC International Workshop on "Environment and Waste Management in Iron and Steel Industries" at NML Jamshedpur (Tata Nagar) including one day training programme on design of pollution control system for metallurgical industry.
10	Steering Committee Meeting of the Natural Disaster Reduction Workshop at CSIR, New Delhi.
21 - 22	TCDC International Workshop on Natural Disaster Reduction: Policy Issues and Strategies held at SERC, Chennai
2000	
March	
02	Seventh Meeting of the Programme Steering Committee
03	Third Meeting of Tripartite Review (TPR) Committee
May	
07-11	Visit of Deputy National Project Coordinator to China for attending International TOKTEN Conference at Beijing
June	
27	First Brain Storming Meeting on Application of IT for Sustainability and Institutionalization of TOKTEN Programme
July	
18	Fifth Meeting of the High Powered Committee for selection of TOKTEN and UNISTAR Experts Second Brain Storming Meeting on Application of IT for Sustainability and Institutionalization of TOKTEN Programme
August	
3	Eighth Programme Steering Committee Meeting (Scheduled)
23-25	International Workshop on "Sustainability Strategy for Promoting Export Competitiveness in Knitwear Industry" Thirupur, Tamilnadu
October	
1-2	National Workshop on Herbal Drugs Activity, RRL, Jammu
6	National Workshop on Disaster Knowledge Network, CRRI, New Delhi

Appendix 8

Recommendations on the Identification of Technological Needs for Small and Medium Enterprises in the Developing countries.

1

Identification of Technology Needs of Small and Medium Scale Enterprises in the Drug and Pharmaceutical Sector in India

1. Resource Centres for Chemical substances, Chemical marker molecules and materials used in quality control and standardization is an urgent need. This will help SMEs maintain product purity and quality to international levels.

2. Dedicated sophisticated test/design/instrumentation centres for quality control are required to serve the needs of SMEs. These centres could be collectively set up by the industry with financial support from state and central governments, financial institutions and the participating industries.

3. SMEs need technological intervention to enhance the techno-economic competitiveness of the currently employed bulk drug manufacturing processes. At present SMEs are not oriented towards chemical engineering. Shifting from batch to continuous processes should be encouraged and supported.

4. There is a need to form SME clusters at various places in the country so that they could be well served by the R&D system and also help in tackling environmental problems. For instance, specific and special solutions to liquid waste disposal problems for land-locked industrial clusters could be devised and applied. SMEs need technological intervention to improve the environmental control units (primary) and common treatment plants (secondary and tertiary levels).

5. Linkages between R&D institutions and SMEs should be strengthened. Innovative methods are suggested, like special contractual arrangement under which the SMEs pay a nominal retainer annually for specified number of tests and trouble-shooting assignments to the national laboratories. In addition to existing uniclient contract arrangements, it is suggested that multi-client contracts be encouraged to reduce financial burden on the SMEs by sharing costs.

6. National laboratories may provide assistance to the industry not only in process modernization and environmental clean-up but also obtaining ISO/GMP certifications.

7. While new drug discovery research could be left to large companies, SMEs could gainfully carry out contractual research/production expecially at the pilot plant level.

8. Patent literacy should be promoted among the SMEs on a very urgent basis. In addition to the patent office, a number of Government departments and agencies like the Department of Science & Technology - TIFAC, NRDC and CSIR concern themselves with disseminating information on patents. Specific CSIR units like Intellectual Property Management Division, New Delhi, National Chemical Laboratory, Pune may also give value added patent information on request.

9. Free patent information is also available from US Patent Office on the Net. This could be extensively used by the SMEs.

10. There is acute shortage of good patent writers. In UK there is a certified Institute of Patent Attorneys which is responsible for training in the IPR field. In India the situation is such that there is not much demand for patent writers and patent attorneys. The situation, however, is bound to change. It is time to establish a suitable initiative to create pools of good patent writers.

11. Organisations like National Productivity Council could play a major role in assessing and increasing the productivity of SMEs and publication of periodical reports on national productivity in the sector.

12. In order to encourage the industry to take up R&D and to minimise bureaucratic hassles a single window clearance for registration and renewals suggested. At present, it has to go through the Departments of Scientific and Industrial Research and Revenue (the Income Tax Authorities). Applications through e-mail may also be encouraged.

13. Apart from assistance from its constituent laboratories, CSIR could make available expertise/experts from abroad to the industry where there is identified need. Visits of NRI experts could be organised through TOKTEN programme to meet specific industrial needs. The experts could come to India, spend agreed time with the industries and go back without much cost to the industries or their associations. Other UN programmes under which resource persons could be made available on a short-term basis may also be extended to the SMEs. The rate of technological obsolescence is so rapid that the induction of new technology would be a big problem to the existence of some of the SMEs in this sector, and interactions with overseas experts can be of considerable help in this regard.

14. There is need to build up a viable information network for the use of SMEs in this sector. The information base could not only have information on current technology and scientific developments and changing market needs in the field but also information about experts and range of expertise available for consultation and trouble-shooting. Information about expertise available with NRI's should also be included. This would help in sourcing them as and when needed.

15. The *modus operandi* for collaboration between industry and local research institutions be reviewed to make the relationship more vibrant and mutually gainful. Management of technology and innovation should be accorded

high priority. Future managers would need considerable skills in project management, management of innovation and technological change.

16. SME Associations are advised to run campaigns, to raise awareness among their members about the necessity for greater employment of professionals and for increased research - industry cooperation.

17. Industrial fellowships may be instituted to facilitate mobility of scientists and technologists from national laboratories and academic institutions to promote closer understanding between the industry and the R&D systems.

18. To fully utilize the export potential of Herbal Drugs which is expected to have a market value of $20 to $50 billion in the not too distant a future, SMEs could take up production in this area. However, there is a urgent need for standardization of various materials and components used in the Industry. The mindset of practitioners of traditional medicine has to change so that the knowledge is useful to the humanity at large as well as commercially viable. CSIR laboratories could play a vital role in this regard.

19. Foreign store-front offices and sending technical missions abroad can also help.

20. Finally it is strongly urged that a few pilot projects be undertaken to implement these recommendations and stimulate multiplier effect across the SMEs sector of the pharma industry.

2

Project for Assessment of Technology Needs in SME's Engaged in Manufacturing of Wood Substitutes

Key recommendations emerging out of the study and action required are given blew:

1. To enable SMEs to adopt the right and appropriate technologies for the materials and composites to function in the market place as wood substitutes, it is important that the base materials are characterised for their properties and sustainability for different production levels established.

   BMTPC has taken an initiative in this regard by establishing a Building Materials Characterisation Centre at Regional Research Laboratory Bhopal, with the joint funding from CSIR and DST.

2. Appropriate processes and technologies need to be identified and developed to ensure that the present levels of productivity are enhanced, energy consumption is reduced, and above all, the productivity of the basic raw materials is improved, with the larger objective of increasing the pro-rata use of natural and by-product resources.

3. Institutional arrangement should be made to identify more and more renewable raw material resources as also more and more wastes from agriculture and industry, in order to enlarge the availability of building materials and wood substitutes.

4. Complacency in product design should be discuouraged and manufacturers should be motivated to upgrade their product designs and quality by a machanism of continuous feedback from the users and through market research on the product. There shoud be close interaction between concerned R&D institutions and SMEs for innovation in product design on an ongoing basis.

5. Large scale and wide spread technology extension services should be made available at the door step or at the development centres of SMEs to enable them to understand the alternate possibilities so that at least some of the SMEs can adopt innovation, think about newer materials and newer technologies and resort to some of the best practices available world wide.

There is a need to disseminate periodically some of the best practices established globally.

6. Entrepreneurs and management level personnel in the SMEs need to be trained in the finer aspects of acquisition and transfer of technology, on an ongoing basis. Inter-SME and inter-SME-institution interaction at decentralised locations would play great role in this regard.

7. For efficient manufacturing processes, available equipment within the country should be first attempted for upgradation by the concerned research institutions. A suitable mechanism can be devised for sharing the expenses between Govt. and manufacturers/entrepreneurs. If this is not possible, all assistance including financial and fiscal should be provided to the manufacturers right from the identification to the import of the right equipment.

8. Improvement in management skills of SME owners and managers and raising technological levels are both essential to enable SMEs to modernise and expand into efficient and competitive businesses in composites and wood substitutes.

9. Institutional funding and Venture Capital Funds should be made easily accessible to SMEs for the purpose of acquisition and adoption of newer technologies, purchase and installation of additional/balancing equipments, enabling them to push the innovative composites and wood substitutes in the market.

10. Many times technologies developed by institutions and enterprises are at a level which is only slightly beyond the laboratory scale. It is important that these technologies are re-engineered and properly packaged at appropriate level for adoption by the SMEs. Even if, pilot plants are required to be commissioned for re-engineering and repackaging of technologies, they should be eligible for liberal funding from research and innovation promotion organisations. The role of CSIR, DST and BMTPC is worth mentioning in this regard.

11. Since wood substitute products are eco-friendly in nature, all government user agencies like State PWDs etc. should prefer these products to conventional products, taking into account the environmental implications, even if the cost of these products is slightly higher.

12. Research and development results in the case of composites and wood substitutes and the practices adopted by successful SMEs should be widely publicised, just as any other product.

13. A number of innovative composite materials and wood substitutes face stiff competition from competing technological options and thus find difficulty at the time of introduction. Many SMEs perish in the exercise of juggling between expensive products, under-utilisation of capacities and higher interest burdens. To promote innovation, it would be worthwhile for the governments at the Central and State levels to devise ways and means for reduction/exemption of excise duties, custom duties, octroi and sales tax. Other fiscal and non-fiscal incentives need to be devised and implemented.

3

Technology Needs for Mango Processing Industries – CSIR-UNDP Study

Pre- Harvest aspects

- Standardisation of agro techniques for higher productivity
- Studies on irregular bearing of commercial varieties
- Studies on effective spray treatment for control of insect infestation.

Post- Harvest aspects

- Mechanical desapping and reduction of sap injury
- Support for commercial level pre-cooling, wax coating and pesticide treatment facilities

- Support for development of automatic continuous hot water treatment system for accelerated and uniform ripening

Processing aspects

- Financial support for development of complete automatic system for preparation of fruits for processing
- Indigenous development of small scale aseptic filling system

By-products

- Support for installation of byproducts processing plant from kernels and skin
- Financial support for effluent and waste handling system

Quality assurance

- Training in HACCP for TQM to the technical personnel of processing industries
- Financial support for practicing HACCP to TQM

4

National Consultation on Modernization of Tanneries in Small and Medium Enterprise Sector in India

Modernization of tannery sector is a fundamental need for the Indian leather sector. Tannery Modernization fund and a scheme are timely needs.

A pilot for implementation of modernization packages in tanneries to fine tune a suitable scheme with all suggestions is recommended. 50 tanneries may be included in the pilot study. Enrollment of tanneries covering all regions and different investment potentials for pilot study to be based on objective criteria.

An assistance upto 25-30% levels of investments required by way funding schemes is essential drive modernization. In case of small scale units 30%

and medium scale 25% are recommended levels subject to some ceiling amounts.

Modernization programme may require to be industry driven.

Financial institutions to be enrolled into the modernization scheme to facilitate financial assistance to tanneries. Financial institutions may be involved to assess bankability of proposals submitted by tanners.

Capping on Government assistance to modernization needs based on realistic levels and discussions with industry and institutions are recommended.

A Steering Committee is required for implementation of Tannery Modernization Scheme.

Organisation of Awareness exercise and Training Programmes is an essential step for workers.

Preparation of database on machinery in terms of range, capability, costs, reconditioning possibilities as well as policy inputs for sourcing reconditioned machinery may be required.

Classification of levels of modernization may be based on investment capacity and modernization needs.

Appendix 9

Indian Industry Beneficiaries of TOKTEN Programme

(1)	**TCDC International Workshop & Training Programme on Hydrogen Energy and related Technologies**	**BHU Varanasi**	**29 November to December 1, 1996**

1. Tata Energy Research Institute
   India Habitat Centre
   Lodhi Road
   New Delhi - 110 003

2. Bharat Heavy Electricals Limited
   Vikas Nagar, Corporate Research & Development Division
   Hyderabad - 500 093

3. Shri AMM Murugappa Chettiar Research Centre
   Photo Synthesis & Energy Division
   Taramani
   Chennai - 600 113

4. ASSOCHAM
   The Associated Chambers of Commerce and Industry of India
   11, Community Centre,
   Zamrudpur
   New Delhi - 110 048
   Fax: 6451981, 6292319
   E-mail: assocham@sansad.nic.in

(2)	**TCDC International Workshop on Application of On-line Instrumentation in Pulp & Paper, Leather & Food Processing Industries**	**CEERI Centre, Chennai**	**February 3 - 11, 1997**

1. The Mysore Paper Mills Limited
   P. O. Paper Town
   Bhadravati - 577 302
   Shimoga Dist.
   Karnataka, India

2. Shri AMM Murugappa Chettiar Research Centre
   Photo Synthesis and Energy Division
   Taramani
   Chennai - 600 113 (T. N.) India

3. Mukerian papers Limited
   Mukerian - 144 211
   Dist. Hoshiarpur
   Punjab, India

4. SPB Projects & Consultancy Limited
ESVIN House, Perungudi
Chennai - 600 096 (T.N.), India

5. J K Corporation Limited
J K Paper Mills, P. O. Jaykaypur
Dist. Rayagada, Orrisa, India

6. Central Pulp & Paper Research Institute
Post Box No, 174
Paper Mills Road, Himmat Nagar
Saharanpur - 247 001 (U.P.), India

7. ITC Limited
Tribeni Tissues Division
Tribeni House
Calcutta - 700 020
West Bengal, India

8. Orient paper Mills
P. O. Amlai Paper Mills - 484 117
Dist. Shahdol (M.P.), India

9. Moogaon Paper Mill
Kagaj Nagar - 782 413, Assam, India

10. MILAN Consultants
Krishna Colony
"SANGETDHARA" Society
Ramakrishna Paramhans Nagar
Off. Pand Road
Pune - 411 038, Maharashtra, India
Tel: 0091-212-337 112
Fax: 0091-212-337 112

11. M/s Elof Hansson (India) Pvt. Ltd.
V K P Illam
Cathedral Road
Chennai - 600 086
Tamil Nadu, India
Tel: 0091-44-827 2141
Fax: 0091-44-826 7078

12. Technico
Udyog Bhawan, Sonawala Road
Goregaon (E), Mumbai - 400 063
Maharashtra, India
Tel: 0091-22-871 7103
Fax: 0091-22-871 7187

13. M/s Beloit Walmsley Ltd.
"Akshaya"
W 116-A, Annanagar West Extension
Chennai - 600 101
Tamilnadu, India
Tel: 0091-44-625 0391
Fax: 0091-44--625 7634

14. Hindustan Paper Corporation Limited
Park Street
Calcutta - 700 016
West Bengal, India
Tel: 0091-33-297806
Fax: 0091-33-2494996

15. Esvin Technologies
Esvin House, Perungudi
Chennai - 600 096
Tamilnadu, India
Tel: 0091-44-4966062

16. M/s Chellam Marketing & Consultancy Pvt. Ltd.
South Boag Road, T. Nagar, Chennai - 600 017

(3) TCDC International Workshop cum Training Programme on Herbal Drugs — **RRL, Jammu** — **September 18-22, 1997**

1. Dabur India Ltd.
Dabur Research Foundation
22, Site IV, Sahibabad
Ghaziabad – 201 010 (U.P.)

Fax: (0575) 770913

2. Zandu Pharmaceutical WorksLtd.
70 Gokhle Road South
Dadar
Mumbai- 400 025
Tel: 022-4307021
Fax: 022-4375491
Email: zanduho@giasbm01.vsnl.net.in

3. Ayurvedic Hospital and Research Centre
Arya Vaidya Sala
Kottakkal-676 503
Tel: 0493-742216-19
Fax: 8364049

(4)	**TCDC International Workshop on Advances in High Performance Concrete Technology & its Applications**	**SERC, Chennai**	**April 16 - 18, 1997**

1. Nuclear Power Corporation
   Vikram Sarabhai Bhawan
   Central Avenue, Anushaktinagar
   Mumbai - 400 094

2. National Thermal Power Corporation
   NTPC Bhawan, SCOPE Complex
   7, Institutional Area
   Lodhi Road, New Delhi - 110 003

3. RMC Readymix (India) Pvt. Ltd.
   401 Dakshina, Sector II, CBD Belapur
   Navi Mumbai - 400 612

4. The Associated Cement Cos. Ltd.
   CRS Complex, LBS Marg
   Thane 400 604
   Maharashtra State

5. La Maison Consultants Pvt. Ltd.
   1, Paul Appaswamy Street
   T. Nagar
   Chennai - 600 017

6. Cement Manufacturers Association
   Vishnu Kiran Chamber
   2142-47, Gurudwara Road
   Karolbagh, New Delhi - 110 005

7. National Council for Cement and Building Materials
   34th KM Store
   Delhi-Mathura Road (NH2)
   Ballabgarh - 121 004, Haryana

8. Indian Rayons Industries Ltd.
   Unit - Rajashree Cement
   Pune

9. FOSROC Chemicals (India) Ltd.
   4th Floor, Shankar House
   Mehkri Circle, Bangalore - 560 080

10. Gammon India Ltd.
    Gammon House
    Prabhadevi, Mumbai - 400 025

11. ECC Group of L&T
Mount-Poonamallee Road
Manapakkam Chennai - 600 089

(5)	**TCDC International Workshop on Application of Biotechnology in Biofertilizers and Biopesticides**	**IIT, Delhi**	**October 15 - 18, 1997**

1. Tata Energy Research Institute
Darbari Seth Block
Habitat Place, Lodi Road
New Delhi - 110 003

2. Southern Petrochemical Industries Corporation Ltd.
SPIC Centre, 97, Mount Road
Chennai - 600 032

3. All India Biotech. Association
VIPPS Centre
2 Local Shopping Centre
Block EFGH, Masjid Moth
Greater Kailash II
New Delhi - 110 048

(6)	**TCDC International Workshop on Surface Engineering & Coatings**	**NAL, Bangalore**	**June 25-30, 1998**

1. Hindustan Aeronautics Ltd., Cubbon Road
Bangalore - 560 001

2. Multi Arc India Pvt. Ltd.,
Kadamgini Complex
Hanuman Road, Vileparli (E)
Mumbai - 400057

3. M/s Tribology India Ltd., Chennai

4. Ms Carborandum Universal, Chenna

5. M/s Indo - Balzers, Pune

6. M/s Titan Watch Co.,Bangalore

7. M/s Sunderam Fastners, Chennai

8. M/s Horological Coating India Pvt., Ltd., Bangalore

9. M/s Veeco Industries, Delhi

10. M/s Hind High Vacuum Co., Pvt., Ltd., Bangalore

11. M/s ACC, (Advanced Materials Business Group), Calcutta

(7)	**TCDC Workshop cum Training Programme on Food Processing for Value Addition, Health Care and Nutrition**	**CFTRI, Mysore**	**October 22 - 24, 1998**

1. Karnataka Agro-Industries Corporation Limited
   P. B. No. 2478 Hebbal
   Bangalore - 560 024, India
   Tel: +91 80 3415371
   Fax: +91 80 3411351

2. Tatasons Limited
   Bombay House
   24-Homi Modi Street, Fort
   Mumbai - 400 001, India
   Tel: +91 22 204 37 25
   Fax: +91 22 204 23 23

3. The Micronutrient Initiative
   17, Jor Bagh, New Delhi - 110 003, India
   Tel: +91 11 4619417
   Fax: +91 11 4622707

4. Protein Technologies India Ltd.
   31, Prithviraj Road
   New Delhi - 110 011, India
   Tel: +91 11 4648791 93
   Fax: +91 11 4645857

5. Food Ingredient Specialities (P) Ltd.
   No. 1, Vanagaram
   Ambattur Road, Ayanambakkam
   Chennai - 602 102, India
   Tel: +91 44 6250452/6359536
   Fax: +91 44 6250451

6. Agricultural & Processed Food
   Products Export Development Authority (APPEDA)
   3rd Floor, Ansal Chambers - 11
   6, Bhikaji Cama Place
   New Delhi - 110 060, India
   Tel: +91 6192141
   Fax: +91 11 6192148

7. Nutrine Confectionery Co. Limited
   B. V. Reddy Colony
   P.O. Box 38, Chitoor - 517 001
   Andhra Pradesh
   Tel: +91 8572 26494/23470/23270
   Fax: +91 9572 26646

8. Tetrapack India Ltd.
Takawe BK., Taluka Maval
Pune - 412 106, India
Tel: +91 2114 44127
Fax: +91 2114 44121/44127

9. Smith Kline Beecham R&D Centre
M-69, Greater Kailash - II
New Delhi - 110 048
Tel: 91 11 648 3561
Fax: 91 11 648 3561

(8) Identification of Technology Needs of Small & Medium Scale Enterprises in the Drugs and Pharmaceutical Sector in India — **COSTED, Chennai** — **October 1999**

1. Shri Salvador Fernandez
Managing Director
M/s Info French Lab. Ltd.
19, 3rd Main Road
Ram Nagar, Nanganallur
Chennair - 600 061

2. Shri T Ravichandran
Managing Director
M/s Pharm Products Pvt. Ltd.
AH-196, III Street
Shyanthi Colony, Anna Nagar
Chennai - 600 040

3. Shri T Munuwamy Naidu
M/s Romet India Lab.
30/1 Pinjala Subramanian Street
T. Nagar, Chennai - 600 017

4. Shri M Vardarajan
Managing Director
M/s Kniss Lab. Pvt. Ltd.
No. 12 5th Main Road
Krishna Nagar, Virugambakkam
Chennai - 600 096

5. Shri N R Rajendran
M/s master pharmaceuticals
87/2B, Pillaiyar Koil Street
Thoraipakkam
Chennai - 600 096

6. Dr. K A Narendranath
Vice President
M/s T T K Pharma Ltd.
No. 8, Old Trunk Road
Pallavram, Chennai - 600 043

7. Shri S Madhavan
General Manager
M/s APEX Lab. Pvt. Ltd.
76, C P Ramaswamy Road
Alwarpet, Chennai - 600 018

8. Shri S M k Ketchaani Rajan
M/s Tanmed Pharmaceuticals
36, 53rd Street, Ashok Nagar
Chennai - 600 083

9. Shri B Sethuraman
M/s Abilash Pharma Pvt. Ltd.
1, Kannaiamman Koil Street
Shenoy Nagar
Chennai - 600 030

10. Shri K R Raveshanker
M/s MAHAA BIIO
79, Al Blaock, 5th Street
Anna Nagar, Chennai - 600 040

11. Shri M Lakshmanan
M/s Pharma Fabricon
Otthapatti
Karupaayurani Post
Madurai - 625 020

12. Shri S V Veerramani
Managing Director
M/s Fourrts India laboratories Pvt. Ltd.
No. 9A, 5th Main Road
Bhakthavatsalam Nagar, Adyar
Chennai - 600 020

13. Shri D Parthasarathy
Managing Director
M/s Dollar Company Pvt. Ltd.
Andhra Insurance Building
156, Thambu Chetty Street
Chennai - 600 001

14. Shri L Lakshminarayanan
M/s ARLAB (India)
B-22, SIDCO Complex
Alathur, Chennai - 603 110

15. Mr. M Sudheer Reddy
Granules India Ltd., Hyderabad

16. Dr. V V Subba Rao
Tech. Dev Board, Hyderabad

17. Mr. K Radha Krishna Murthi
B D M A , Hyderabad

18. Mr. V V Subba Reddy
B D M A
Hyderabad

19. Mr. P R Agarwal
AVON Granics Ltd.
Hyderabad

20. Shri Anup Agarwal
Sreepathi Pharma
Hyderabad

21. Mr. A V Narosa Reddy
Hetero Labs Limited
Hyderabad

22. Mr. L V Sunil
Saroco Labs Limited
Hyderabad

23. Dr. B S Bajaj
OTIRA Pharmaceutical
Hyderabad

24. Mr, T V V S N Murthy
S M S Pharmaceutical
Hyderabad

25. Mr. Y Jagadeswara Rao
SMS Pharmaceutical
Hyderabad

26. Dr. G Omprakash
P O L
Hyderabad

27. Mr. V R K Rao
Plant Organics Ltd.
Hyderabad

28. Shri Jayant Tagore
Synthokem Labs
Hyderabad

29. Mr. M S Venkatanarayana
Deccan Drug Ltd.
Hyderabad

30. Mr. Venkata N Meka
Global Drugs Ltd.
Hyderabad

31. Mr. T Laxman Rao
Global Drugs (P) Ltd.
Hyderabad

32. Dr. R Ashok Kumar
Srikrishna Drugs Ltd.
Hyderabad

33. Mr. C R Sarma
Srikrishan Pharmaceuticals Ltd.
Hyderabad

34. Mr. B L R K Prasad
Prasad Drugs Ltd.
Hyderabad

35. Mr. K Venkata Devkai
Prasad Drugs Ltd.
Hyderabad

36. Dr. Deva Kumar
Biological Evans Ltd.
Hyderabad

37. Dr. Renuka Datla
Biological Evan Ltd.
Hyderabad

38. Dr. Sheela Bhide
Principal Secretary
Govt. of A.P., Hyderabad

39. Mr. K Srinivas
Herran Drugs & Pharmaceuticals Ltd.
Hyderabad

40. Dr. N V Reddy
Virchem Lab
Hyderabad

41. Mr. S K Ghosh
Solves Pvt. Ltd.
Hyderabad

42. Mrs. Pratibha Omray
Khandelwal Labs Ltd.
Mumbai

43. Dr. S Satapathi
Khandelwal Labs Ltd.
Mumbai

44. Mr. Vivek Save
Excel Industries Ltd
Mumbai

45. Mr N H Israni
Blue Cross Labs Ltd.
Mumbai

46. Dr. J B Sheth
Calyx Chemicals
Mumbai

47. Dr. Madhu Gautam
Calyx Chemicals
Mumbai

48. Dr. Samir Jajarnis
Sanjivani Parenteral
Mumbai

49. Ms. Aditi Panandikar
Indoco Remedies Ltd.
Mumbai

50. Dr. S Sarangam
Kopran Research Lab
Mumbai

51. Mr. Anant R Thakore
Avik Pharmas Ltd.
Mumbai

52. Mr. S Subramanian
Khandelwal Labs Ltd.
Mumbai

53. Mr. J L Sipathimalani
Chem-Med Analytical Lab.
Mumabi

54. Mr. Suresh Manjirekar
Excel Industries Ltd
Mumabi

55. Dr. Vasant Palkar
Nivedita Chemicals
Mumbai

56. Ms. A Maharao
Calyx Chemicals
Mumbai

57. Ms. Bela Bhandari
Calyx Chemicals
Mumbai

58. Mr. Suresh Kare
Indoco Remedies Ltd.
Mumbai

59. Mr. Mohan Jain
Neon Antibiotics Pvt. Ltd.
Mumbai

60. Mr. Manish U. Doshi
Umedica Labs Ltd.
Mumbai

61. Dr. R B Samarta
Interlink Marketing Consultant
Mumbai

62. Dr. M K Biyani
Ajanta Pharma Ltd.
Mumbai

63. Mrs. S R Vaidya
Laboratories Daffodil
Mumbai

64. Dr. U R Bapat
F D C Ltd.
Mumbai

65. Dr. V Subramani Iyer
B D H Ltd.
Mumbai

66. Mr. Sudhir Gupta
B D H Ltd.
Mumbai

67. Mr. M K Vahaha
Shree Dhootapapeshwar Ltd.
Mumbai

68. Mr. S K Velankar
Lupin Chemicals Ltd.
Mumbai

69. Mr. Ranjit Sharma
Aristo Pharmas. Ltd.
Mumbai

70. Mr. R N Prasad
Aristo Pharmas. Ltd.
Mumbai

71. Mr. D A Shanbhag
Laboratories Daffodil
Mumbai

72. Mr. M A Chandavarkar
F D C Ltd.
Mumbai

73. Dr. V D Patil
B D H Ltd.
Mumbai

74. Dr. A K V Unni
B D H Ltd.
Mumbai

75. Mr. Nikhil J Shah
Marvel Drugs Pvt. Ltd.
Mumbai

76. Mr. Satish Ashtamkar
J B Chemicals
Mumbai

77. Dr. A K Shah
Navil Laboratories
Mumbai

78. Mr. Rahul Sharma
Aristo Pharmas. Ltd.
Mumbai

(9)	**TCDC International Workshop on "Technological Upgradation of Drugs/Pharmaceuticals & Agro-chemical Industries for Global Competitiveness"**	**IICT, Hyderabad**	**November 30 – December 4, 1999**

1. Merck Development Center (India Pvt. Ltd.)
   Panvel, Dist. Raigad
   Maharashtra - 410 208

2. Dr. Reddy's Research Laboratories Ltd.
   7-1-27, Ameerpet
   Hyderabad - 500 016

3. Fredrick Institute of Plant Protection & Toxicology
   (FIPPAT), Padappai - 601 301
   Kancheepuram (Dist.)
   Tamilnadu

4. IDMA
   102, B, Poonam Chambers
   Dr. Annie Besant Road
   Worli
   Mumbai - 400 018

5. Bhaskara Agro Chemicals
   11-5-421/A, Zafarbaugh
   Redhills, Hyderabad - 500 004

6. IPCA Laboratories
   Kandivli (West)
   Mumbai - 400 067

7. Bhagiradha Chemicals & Industries Ltd.
   No. 8-2-248/A/B, Road No. 3
   Banjara Hills
   Hyderabad - 500 034

8. Dhanuka Laboratories Pvt. Ltd.
   Old Maneswar Road
   Gurgaon (Haryana)

9. Pharma Industry
   A-11, Sagarika
   15, 3rd, Seaward Road
   Valmiki Nagar, Thiruvanmiyur
   Channai - 600 041
   Tel: 044-4901137
   Fax: 044-4425752

10. VIPL
    Plot No. 61, 1st Floor
    Nagarjuna Hills
    Panjagutta
    Hyderabad - 500 082

11. Rallis Research Centre
Plot Nos. 21 & 22 Phase II
Peenya Industrial Areas
Bangalore - 560 058

12. Orchid Chemicals & Pharmaceuticals Ltd.
6th Floor, Crown Court 34
Cathedral Raod
Chennai - 600 086

13. Confederation of Indian Industry
Gate No. 31, North Block
JN Stadium, Lodi Road
New Delhi - 110 003

14. EID Parry Ltd
Chennai - 600 001

15. Ralchem Limited
IDA - Phase II
Patancheru - 502 319
Hyderabad (A.P.)

16. Aimco Pesticides Ltd.
Akhand Jyothi, 8th Road
Santacruz (East)
Mumbai - 400 055

17. EID Parry Ltd.
Chennai

18. Shri Satnarayan Gupta, MD
R/o 211, Shivlok, House - 1
Karampura Commercial Complex
New Delhi - 110 015

19. IPCA Laboratories
P O Box No. 7688, 142-AB
Kandivli (West)
Mumbai - 400 067

20. Central Insecticides Laboratories
Faridabad

21. Sri Krishna Pharmaceutucals Ltd.
C-4, Industrial Area
Uppal, Hyderabad - 500 039

22. Vantech Industries Ltd.
103, Vijaya Enclave, Plot No. 32
Sri Nagar Colony
Hyderabad - 500 073

23. Chairman & Managing Director
142, IDA, Cherlapally
Hyderabad - 500 051

24. Virchow Laboratories Ltd.
Plot No. 6, SV Cooperative Industrieal Estate
IDA Jeedimetla
Hyderabad

(10) TCDC International Workshop on "Management of Innovation from Concept to Commercialisation" — **IPFT, Gurgaon,** — **December 21- 24, 1998**

1. Confederation of Indian Industries
India Habitat Centre,
4th Floor, Zone IV, Lodi Road,
New Delhi- 110 003

2. Parmali Wallece,
Bhopal
Madhya Pradesh, Inda

3. Dr. Reddy's Lab, Research Laboratories Ltd.,
7-1-27, Ameerpet
Hyderabad- 500 016

(11) International Consultation Meeting on "Technology & Environmental Upgradation in Leather Sector" Habitat World — **New Delhi** — **November 29 - 30, 1999**

1. Council for Leather Exports
53 Sydenhams Road
Periamet, Chennai 600 003

2. M/s Zam Zam Tanners
13/392 E Civil Lines
Kanpur 208 001

3. M/s Mirza Tanners (P) Ltd
14/6 Civil Lines
Kanpur 208 001

4. Punjab Leather Federation
59, Leather Complex
Kapurthala Road, Jalandhar – 144 021

5. Indian Finished Leather Manufacturers
& Export Association
45,Wuthucattan Street, II Floor
Periamet, Chennai – 600 003

6. Council for Leather Exports
(Northern Region)
Eastern Leather Products Pvt. Ltd.,
C-2 Community Centre
Narain Vihar, New Delhi 110 028

7. AISHTMA
53 Sydenhams Road
Periamet, Chennai 600 003

8. Council for Leather Exports (Western Region)
11/4 World Trade Centre
Cuffe Parade, MUMBAI 400 005

9. Council for Leather Exports (Southern Region)
Race View Towers
71, Mount Road
CHENNAI 600 032

10. Council for Leather Exports (Eastern Region)
Motijug House, No.1, Auckland Place
CALCUTTA 700 017

(12) TCDC International Workshop on "Environment and Waste Management in Iron and Steel Industries" — **NML Jamshedpur (Tata Nagar),** — **December 2 - 4, 1999**

1. Romelt SAIL India Ltd,
New Delhi

2. SAIL-EMD, Calcutta

3. SAIL-RDCIS, Ranchi

4. Crawley & ray Pvt. Ltd., Calcutta

5. Bhilai Steel Plant, Bhilai

6. SAIL, Bokaro Steel Plant
Bkaro, Bihar

7. Rashtriya Ispat Nigam Ltd.
Visakhapatnam, Steel Plant

8. Vayubodhan Upkaran (P) Ltd.,
New Delhi

9. Tata Refractories Ltd., Orissa

10. Tata Steel Jamshedpur, Bihar

11. INCAB Industries Ltd, Jamshedpur

12. Jindal Steel & Power Ltd., Raigarh, MP

13. TRF Limited, Jamshedpur

14. The Tinplate Company of India Ltd., Jamshedpur

15. Durgapur Steel Plant, Durgapur

(13)	**TCDC International Workshop on "Natural Disaster Mitigation: Policy Issues and Strategies"**	**SERC, Chennai**	**December 21-22, 1999**

1. Risk Management Solutions, Inc.
A-7 Sector 16
Noida - 201 301 (U.P)
Tel: 0118-4511102, 4512102
Fax: 0118-4511109, 4510963
Email: rmsi@risknc.com

(14)	**International Workshop on "Sustainability Strategy for Promoting Export Competitiveness in Knitwear Industry"**	**Thirupur, Tamilnadu**	**August 23 – 25, 2000**

Total Number of Industries 35

(15)	**Brainstorming Meeting to assess the problems of Small and Medium Scale Industries**	**CSIR Science Centre Lodhi Gardens, New Delhi**	**Nov. 20-21, 2000**

1. Mr. M S Parthasarathy
President
National Confederation of Small Industries
(NACOSI), 10, GST Road, Guindy
Chennai - 600 032

2. The Chairman
Small Scale Industries Development Bank of India
(SIDBI)
YMCA Cultural Centre
No. 1, Jai Singh Road
New Delhi - 110 001
Tel: 3365728

3. Indian Drug Manufacturer's Association
102-B, Poonam Chambers
Worli, Mumbai - 400 018
Fax: 022-4950723

4. Small Scale Industries
Ministry of Industrial Development
Government of India
Udyog Bhawan
New Delhi

5. Council for Leather Exports
53 Sydenhams Road
Periamet, Chennai 600 003
Fax: 532335
Tel: 5321185

6. Council for Leather Exports
C/o Mirza Tanners Ltd
14/6 Civil Lines, Kanpur 208 001
Tel: 0512-210676/210844
Fax: 0512-210166

7. Council for Leather Exports
Asian Leather Pvt. Ltd.
19A Jawaharlal Nehru Road
Leslie House, Calcutta 700 087
Fax: 033-2497000/2493456

8. Council for Leather Exports
(Northern Region)
Eastern Leather Products Pvt. Ltd.,
C-2 Community Centre
Narain Vihar, New Delhi 110 028
Tel: 011-5794211, 5794732
Fax: 011-5796722, 5794948

9. Council for Leather Exports
62 Jolly Maker Chambers
2, Nariman Point, Mumbai 400 021
Tel: 022-2020459/2020467
Fax: 022-2029944

10. The All India Skin & Hide tanners
Merchants Association, "Leather Centre"
No. 53, Raja Muthaiah Road
Periamet, Chennai-600 003
Fax: 565292
Tel: 589945/2349112/2352690

11. Indian Finished Leather Manufactures & Exporters Association
45 Wuthucattan Street, II Floor
Periamet, Chennai 600 003
Fax: 6445837
Tel: 6441853/6442105/6443954

12. Balluja International Pvt. Ltd
B-128 DDA Sheds
Okhala Industrial Area, Phase - I
New Delhi - 110 020
Tel: 011-6814516
Fax: 011-6817965

13. M/s Amsan Leathers Industries
66 Leather Complex, Kapurthala Road
Jalandhar City
Tel: 0181-250266

14. Saroj International
A/115, New Friends Colony
New Delhi - 110 065
Tel: 011-84552064
Fax: 011-84550930

15. BASF India Limited
Rhone Poulenc - House
Sudam Khaly Ahire Marg
Mumbai - 400 025
Tel: 022-4930703
Fax: 022-4950512

16. Harman Sales Pvt. Ltd.,
201 A, Byculla Service, Industrial Estate
Dadoji Konddeo Marg, Byculla, Mumbai 400 027
Tel: 022-3712893/3712899
Fax: 022-3738814

List of Indian Industries benefited by the Services of TOKTEN and UNISTAR Experts

TOKTEN

Sr.No.	Identification	Expert consultant	Industry
1.	TOKW 14/97	Dr Sunil N Vanikar	ACC Ltd., Mumbai
2.	TOKW 16/97	Prof Surendra P Shah	ACC Ltd., Mumbai
3.	TOKW 17/97	Prof D V Reddy	ADB Project, Mathura
4.	TOKW 18/97	Dr V Ramakrishnan	ADB Project, Mathura
5.	TOK 51/98	Dr. Kedar Nath Tandon	ARC International, Hyderabad
6.	TOK 01/96	Dr Sunil Dutta	Associated Cement Company, Mumbai
7.	TOKW 19/97	Prof Satu M Somani	Ayurveda Res. Centre, Bhartiya Vidya Bhawan, Mumbai
8.	TOKW 07/96	Dr S C Singhal	BHEL, Hyderabad
9.	TOKW 21/97	Prof R D Tyagi	Biotech Association, Delhi
10.	TOK 30/98	Dr. M R Ramsay	Bombay Suburban Electric Supply Ltd., Mumbai
11.	TOK 10/97	Dr M M Sayeed	Bose Inst., Calcutta

Contd.

Sr.No.	Identification	Expert consultant	Industry
12.	TOK 01/96	Dr Sunil Dutta	Carborundum Universal Ltd., Bangalore
13.	TOKW 14/97	Dr Sunil N Vanikar	Cement Manufactures Association
14.	TOKW 17/97	Prof D V Reddy	Cement Manufactures Association
15.	TOK 53/98	Dr. Yoginder P. Chugh	Coal India Ltd., Calcutta
16.	TOK 03/96	Dr Sudhir K Sharma	Co-Nickle Alloys Pvt. Ltd., Mumbai
17.	TOK 42/98	Dr. Subhash C. Minocha	Dabur Research Foundaiton, Gaziabad
18.	TOKW 06/96	Dr (Ms) K Sapru	Delton Cables, Delhi
19.	TOKW 08/96	Dr S Venkatesan	Delton Cables, Delhi
20.	TOKW 14/97	Dr Sunil N Vanikar	DG, Ministry of Surface Transport
21.	TOK 35/98	Dr. M N S Swamy	Electronics & Radar Development Establishment (LRDE), Bangalore
22.	TOK 30/98	Dr. M R Ramsay	Essan Chandran Inst., Bangalore
23.	TOK 29/98	Dr. Venkatesh Shankar	Federation of Indian Export Organisations (FIEO), Chennai
24.	TOKW 14/97	Dr Sunil N Vanikar	Gammon India Ltd., Mumbai
25.	TOKW 16/97	Prof Surendra P Shah	Gammon India Ltd., Mumbai
26.	TOKW 16/97	Prof Surendra P Shah	Highway Res. Station L&T Chennai
27.	TOKW 20/97	Prof Ghanshyam N Pandey	IDPL, Hyderabad
28.	TOK 61/99	Prof. K Linga Murthy	IG Centre for Atomic Research, Kalpakam
29.	TOK 23/97	Dr. Munmaya K. Mishra	IOC Ltd., Faridabad
30.	TOKW 14/97	Dr Sunil N Vanikar	L&T Highway Research Station, Chennai
31.	TOKW 15/97	Prof R K Dhir	L&T, Chennai
32.	TOK 32/98	Dr. Rajendra K Sharma	M/s Panacea Biotech., Chandigarh
33.	TOK 33/98	Dr. M Jeya Chandra	M/s Sakthi Sugars Ltd., Foundry Complex, Coimbatore
34.	TOK 30/98	Dr. M R Ramsay	Manganese Ore India Ltd., Nagpur
35.	TOK 45/98	Dr. Desiraju B. Rao	NCMRWF, New Delhi
36.	TOKW 20/97	Prof Ghanshyam N Pandey	Ranbaxy Lab., Delhi
37.	TOK 03/96	Dr Sudhir K Sharma	SAIL, Delhi
38.	TOK 01/96	Dr Sunil Dutta	SAIL, Ranchi
39.	TOK 28/98	Dr. Tapan K Sarkar	SAMEER, Mumbai
40.	TOKW 38/98	Prof. Ajay P. Malshe	SAMEER, Mumbai
41.	TOK 12/97	Dr Suraj P Bhat	Shankar Netralaya, Madras
42.	TOK 42/98	Dr. Subhash C. Minocha	SPIC Science Foundation, Chennai
43.	TOKW 08/96	Dr S Venkatesan	SPIC, Chennai
44.	TOK 12/97	Dr Suraj P Bhat	SPIC, Chennai
45.	TOK 03/96	Dr Sudhir K Sharma	TIFAC, Delhi
46.	TOK 34/98	Dr. Basavraj Hiremath	WIPRO (India) Ltd., Bangalore

UNISTAR

Sr.No	Identification	Expert consultant	Industry
1.	UNIS 10/97	Dr. Paul W Singleton	Biotech International Ltd., New Delhi
2.	UNIS 11/97	Dr. Brian A Federici	Biotech International Ltd., New Delhi
3.	UNIS 09/97	Prof R P Labadie	Dabur Research Foundation, Sahibabad
4.	UNIS 01/96	Dr T N Veziroglu	DLW, Varanasi
5.	UNIS 02/96	Dr H Buchner	DLW, Varanasi
6.	UNIS 03/96	Mr Eike Willers	DLW, Varanasi
7.	UNIS 19/98	Dr. David A. Rigney	DUCOM, Bangalore
8.	UNIS 06/97	Prof Charles Goodspeed	Gammon India Ltd., Mumbai
9.	UNIS 10/97	Dr. Paul W Singleton	GSFC, Baroda
10.	UNIS 19/98	Dr. David A. Rigney	IARC for Powder Metallurgy & New Materials, Hyderabad
11.	UNIS 22/99	Dr. Paul G Shemon	IARC for Powder Metallurgy & New Materials, Hyderabad
12.	UNIS 07/97	Mr Charles Allens	L&T, Mumbai

Contd.

Sr.No	Identification	Expert consultant	Industry
13.	UNIS 05/97	Ms Marjatta Ollila	M/s Ahlstrom Corpn, Delhi
14.	UNIS 05/97	Ms Marjatta Ollila	M/s Technico, Mumbai
15.	UNIS 09/97	Prof R P Labadie	NIPER, Mohali, Punjab
16.	UNIS 07/97	Mr Charles Allens	Nuclear Power Corporation
17.	UNIS 32/99	Dr. J V Krouzek	SAIL, Ranchi
18.	UNIS 01/96	Dr T N Veziroglu	SIRI, Varanasi

Appendix 10

P. V. Indiresan

B-57 Hill View Apartment
Vasant Vihar, New Delhi 110
057 ***Tel****: 6145091*
E-mail*:* indiresan@bol.rnet.in

REFORM OF TOKTEN, TCDC AND UNISTAR PROGRAMMES

The following proposals refer to the issue of evolving suitable reforms for the existing TOKTEN, TCDC and UNISTAR programmes. The National Coordinator had particularly desired that the following three concerns of his should be examined. (a) Fears of Non-sustainability, (b) Absence of focus and (c) Weak linkages with the industrial sector.

Therefore, the task set for the present exercise was that suitable reforms should be suggested and an appropriate scheme should be formulated for removing the above lacunae. It was also suggested that the existing multiplicity of similar missions should be brought under one umbrella to provide an integrated approach for establishing linkages between national organisations and NRIs as well as industrial associations in other countries.

The following are the Terms of Reference given by the National Project Coordinator. The enclosed proposals deal with each one of them in order of sequence. For the sake of clarity, Reference (2) has been split into two with the result there are six sections to meet the five terms of reference.

I am grateful to the National Project Coordinator for his advice and his staff for their support. The proposals suggested are tentative. After getting feedback from various stakeholders, they will be finalised.

TERMS OF REERENCE

1. Examine in consultation with CSIR and other relevant ministries, missions abroad, industry organisations, selected TOKTEN experts the practicability of setting up a fund through contributions from NRI community and other sources to finance future TOKTEN activities.

2. Examine changes in government policies, rules and procedures required for setting up such a fund, and also to identify issues/incentives that will induce the NRI community to contribute to such a fund.

3. Make recommendations as to the commitments of government of India.

4. Identify recommendations regarding the management structure for future TOKTEN activities keeping in new financial mechanisms envisaged.

5. Make future recommendations as required for operationalising the new modalities including transitional arrangements.

TECHNOLOGY TRANSFER - SPECIFIC PROPOSALS

1. *The practicability of setting up a fund through contributions from NRI community and other sources to finance TOKTEN activities.*

- The TOKTEN programme has been operating with an effective input (in cash and kind) of about US$ 500,000 a year. Last year, IIT Delhi alone secured more donations from its alumni. In the case of IIT Bombay, one single old student donated 2 million US dollars. We may therefore conclude (a) sources of donation are available far in excess of what TOKTEN has been able to provide so far and (b) such donations are being offered mainly by alumni.

- In the World Conference on Science held in Budapest in June-July 1999, India raised the following argument:

- World over, there is an asymmetric movement of talented people, by which rich nations have been able to secure highly talented youth from developing countries. Rich nations cannot sustain that inflow, and will lose the services of such talent, unless they help developing countries to maintain a high quality of instruction in their schools and colleges. I suggest UNESCO may initiate a programme that will induce the rich nations to support, in their own self-interest, world class education in poorer countries.

- India received such a substantial endorsement of this argument that the World Conference has formally proposed that this idea be taken up by the General Conference of UNESCO to be held in October-November, 1999. Evidently, there is increasing awareness in rich countries that it is their self -interest to help educational and research institutions in countries like India. Already, a number of MNCs have started making substantial investments worth tens of millions of dollars in institutions like IITs.

- It may therefore be concluded that funds are available for projects on technology transfer provided there are institutions inspire the confidence that funds will be used productively.

2. *Changes in government policies, rules and procedures required for setting up a fund for Technology Transfer*

- With government institutions, donations are liable to be taken over by the Consolidated Fund of the Central or the State government as the case may be. In such a case, the institution loses control completely over the funds received. That will never be acceptable to donors. Hence, as a first step, all donations must be strictly isolated from the Consolidated Fund of the concerned government.

- As a rule, each donor will make stipulations about the use of the donation. It will be a frustrating and time consuming process if prior approval of the government is required for each and every condition. Therefore, every educational and research institution should be permitted to set up an autonomous committee with the freedom to frame its own rules and regulations for operating the donations.

- The Government of India will, however, like to maintain a check on foreign donors particularly when large amounts are involved. For that reason, the Finance Ministry may have a Central Committee for Granting Approval for Foreign Donors for donations exceeding a specified amount. Once a donor is approved, no separate approval may be demanded whichever be the institution to which donations are made. It is important that the minimum exemption amount should be

revised each year depending on the rate of inflation and growth of the economy. As a thumb rule, all amounts less than a hundred times the current per capita income may be allowed to be accepted freely.

- The same Committee as above may check that all institutions receiving donations keep proper accounts of donations received and utilised.
- No donation may be accepted if that involves a perpetual liability unless the donation is adequate to meet such expenses even after accounting for the progressive devaluation of the capital amount.
- Institutions should be free to accept anonymous donations.
- It would encourage collection of donations if the government provides matching grants.
- As far as possible, no donor should have any cause to approach the government or get the concurrence of any government official to make any donation except, as stipulated above, in the case f large foreign donors.

3. Incentives for NRIs making donations

- Theoretically, three kinds of incentives can be considered to induce NRIs (and MNCs too) to invest in Indian education and R&D. Those three are financial returns, influence (or power) and prestige.
- NRIs are unlikely to seek financial returns but MNCs will surely do so. Such returns need not be direct but merely consequential.
- NRIs would enjoy having opportunities to exert influence and may even spare some time to sit on councils that have some powers to take decisions. In particular, they would like to be assured that their donations will be well spent. F or that reason, they may like to be associated with any body that disposes of their donations. Social rewards are also good incentives even though the experience of IIT Delhi indicates that all of them care for them.
- The simplest way to attract NRIs is to institute Distinguished Alumnus

awards Earlier Distinguished Alumni may be invited to offer nominations for future awards both for conferring influence and prestige and to seek information.

- As a permanent momento the distinguished alumni may be invited to plant trees on the campus that will prominently have a plaque carrying their name.

- Alumni and NRI donors may be invited to elect one or two nominees on the Governing Board of the institution.

- All donors may be given a free option to commemorate their donations in who so ever name they wish.

- The biggest incentive is total absence of bureaucratic hassle, freedom from running from pillar to post and prompt and authoritative replies to their queries.

- MNCs would rarely like to be seen to exert influence or power but may be happy to nominate their officials to sit on committees. They would definitely welcome any publicity they can get.
- MNCs will appreciate free allocation of space to construct laboratories and other similar amenities.

- MNCs will like the freedom to negotiate directly with receiving institutions without having to go through the hassle of getting government approvals.

4. Commitments to be made by the Government of India.

- The most important commitment that the Government of India (and state governments too wherever they are involved) is full autonomy in the disposition and use of donations. In particular, the government should give an assurance that there will be no political or bureaucratic interference in the operation of the donation. Therefore, this scheme can operate only with autonomous institutions including private ones.

- The government should have simple rules to let institutions accept foreign donations either in cash or in kind.

- Where donations are in kind, there should be no import duties to be paid and a fast channel should be opened in customs to clear the goods.

- It would be best if the government stays away from any control prior to the donation and institutions are given freedom to negotiate without getting prior approval of the government.

- The government will frame rules that are as simple and as transparent as possible. In general, the government should confine itself to collecting data and monitoring audit reports.

- If at any time, the government is unhappy with the activities of any particular institution, it may debar such an institution from accepting future donations but will not, for that reason, impose bureaucratic controls on all others.

- The government will instruct Indian chanceries abroad to issue visas to donors and their family members promptly and courteously in case they have foreign citizenship. That is particularly important in the event relations between India and the country, to which donors belong, are strained.

- It would be best if the government were to appoint a Non-official Committee (or establish a Society) to oversee how donations are operating instead of regulating them directly through any ministry, and certainly not through a complex combination of ministries.

- The government may guarantee that any fund received through the above Committee will not be absorbed into the Consolidated Fund and the recipient institution will be authorised to utilise the same without seeking prior approval.

5. Management structure for future TOKTEN activities

- TOKTEN activities involve three kinds of tasks. One, seeking and securing funds from abroad and from local industry. Two, arranging tour programmes for visiting experts. Three, coordinating activities with

industry organisations. Few educational or R&D institutions will have the experience or the means to perform such tasks. For that reason, it would be desirable to establish a National Committee for Technology Transfer (NCTT).

- NCTT should be an autonomous body outside the day-to-day control of the government. A scientist or an engineer or an industrialist of international repute may chair it. The President of India or the Vice-President or the Prime Minister could be designated as Patron to add prestige to the Committee. It should have a small secretariat that will:

- Maintain detailed data on S&T experts and also on emigrants.
- Monitor audit reports of all institutions that receive donations directly from NRIs and MNCs.
- Help educational institutions to keep track of their alumni and secure assistance from them from time to time.
- Organise a web site on Technology Watch.
- Institute national awards for outstanding donors.
- Organise tour of experts visiting India and help Indian specialists travel abroad but only when the local institution desires such assistance.

- The NCTT may be composed of reputed nationally known non-official members nominated by science ministries, the education ministry, external affairs ministry, commerce ministry and the finance ministry alongwith representatives of major NRI donors and MNC donors. An official of CSIR may be nominated as member-Secretary who will also be responsible for all administrative matters.

- Every institution that seeks to receive NRI and MNC funds should be registered with the NCTT and as a token pay a fee of 0.5 percent of donations received. That will make' NCTT effectively independent of government support and hence be able to maintain its autonomy.

- Every institution desirous of receiving NRI and MNC funds should have secretariat of its won to solicit, receive, utilise and audit the amounts received. To meet such expenses, it should be empowered to retain 2.5 percent of all donations received.

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6. Operationalising the new modalities including transitional arrangements.

- All these years CSIR has been organising the TOKTEN programme. There is no reason to change this arrangement. Therefore, DSIR may continue to be the nodal ministry with CSIR providing secretarial and administrative support. The existing TOKTEN secretariat may be used for the purpose.

- For a start, NCTT may be constituted to take over the existing operations of the TOKTEN secretariat.

- A. G. O. may be issued empowering NCTT to authorise both government and private institutions to receive donations from NRIs and MNCs without having to credit them to the Consolidated Fund.

- NCTT may take immediate steps to update records of NRIs and other possible donors and to collect information concerning donations from abroad.

- NCTT may open a web site immediately offering information about institutions in India. The website may also prepare a Roll of Honour of the largest donors under two categories, individuals and firms.

- The Roll of Honour may be got ready for formal announcement by Independence Day and arrangements made to honour all those that get on the Roll through a reception hosted by a dignitary such as the President of India. That reception may be scheduled for Teachers' Day, September fifth.

- Once such arrangements are made, it is more than likely that ample donations will be forthcoming. The target for the same should be set at a hundred million US dollars. That is not easy, but feasible.