UNIVERSITE DU QUEBEC

THESE PRESENTE A

L'UNIVERSITE DU QUEBEC A TROIS-RIVIERES

COMME EXIGENCE PARTIELLE DE LA MAITRISE EN ECONOMIE ET GESTION DES SYSTEMS DE PETITES ET MOYENNES DIMENSIONS

PAR

SUKTI MALDAS

# TECHNOLOGY TRANSFER PROCESSES BETWEEN CANADA AND INDIA

1996

## RÉSUMÉ

La technologie est devenue un facteur dominant de la croissance économique à l'échelle mondiale, aussi bien pour les pays en voie de développement que pour les pays développés. D'une part, les processus de transfert de technologie vers les entreprises de pays en voie de développement permettent à ces dernières d'améliorer leurs capacités technologiques et concurrentielles au niveau domestique. D'autre part, les entreprises de pays développés cherchent à exporter leurs produits et connaissances technologiques en prenant en compte la saturation de leurs propres marchés domestiques.

Dans cette recherche, nous analysons le processus de gestion de transfert de technologie entre des entreprises du Canada et de l'Inde. Le processus de transfert de technologie a été défini comme étant constitué des phases suivantes : la prospection et le choix de partenaires, la définition des objectifs communs, contenu technologique du transfert, la négociation des conditions de transfert et l'implantation du transfert, particulièrement les aspects légaux, financiers, formation de personnel, apprentissage organisationnel et performance.

Les principales étapes méthodologiques de cette recherche ont été une recension de la documentation scientifique sur le sujet des transfert de technologie, le développement d'un cadre de référence théorique, l'élaboration d'un questionnaire et son envoi par courrier auprès d'un échantillon d'entreprises du Canada et de l'Inde, identifiées comme partenaires d'un transfert technologique. Au total vingt-sept entreprises,

13 du Canada et 14 de l'Inde ont répondu. Les résultats de l'enquête ont été analysés avec le logiciel SPSS.

Les principaux résultats de cette recherche sont les suivants :

- 66.7% des transferts représentent des ententes de vents directes de technologies entre entreprises indépendantes.

- 70.4% des transferts ont été initiés par des entreprises de l'Inde.

- Le principal objectif des entreprises canadiennes était l'expansion des ventes de produits existants. Pour les entreprises indiennes les objectifs les plus importants étaient l'amélioration de la qualité de leurs produits ainsi que la productivité accrue de leurs opérations.

- Les principales formes de technologie transférées étaient sous forme de design de procédé et de produit (92.6% des transferts) ainsi que d'équipement (18.5%).

- La durée du processus de négociation du transfert a été de 1 à 2 ans dans 51.8% des cas. Dans 29.7% des cas la durée a été de 6 mois à 1 an, alors que 18.5% des transferts ont été réalisés en moins de 6 mois.

- La principale forme légale de transfert était l'accord de licence de fabrication (51.8% des cas).

- La principale forme de transfert de droits non-statutaires reliés à ces technologies était en "savoir-comment" d'application de cette

technologie à l'échelle industrielle (66.6% des cas).

- La durée des ententes de transferts était variable, allant de 0 à 2 ans (27.2% des cas), de 2 à 5 ans (36.4% des cas) à 5 à 10 ans (36.4%).

- Les restrictions géographiques à l'utilisation des technologies étaient surtout une préoccupation pour les entreprises canadiennes dans ces transferts.

- Les principaux droits statutaires accordés par la licence portaient sur les droits d'accès aux améliorations technologiques du fournisseur (33.3% des cas).

- Au total, 48.1% des entreprises ont mentionné n'avoir rencontré aucun problème légal majeur, bien que la lourdeur des structures bureaucratiques gouvernementales en l'Inde ait été souligné par les entreprises canadiennes.

- Le paiement des droits de transferts des transferts était soit par étape (33.3% des cas) ou par paiement unique (14.8%). Peu de cas impliquaient le paiement de redevances supplémentaires selon le volume de vente.

- La formation incluse dans le transfert était surtout à caractère technique (59.2% des cas).

- Dans l'ensemble, la majorité des entreprises de l'Inde (57.2%) ainsi que du Canada (53.8%) se sont dit satisfaites des retombées obtenues suite à leur transfert de technologie.

En conclusion, cette recherche montre que le mécanisme de transfert de technologie entre entreprises de pays développés et en voie de développement peut s'avérer performante pour les parties en cause. De plus, elle met en evidence les principales dimensions et difficultés particulières à ces processus de transfert. De là, il devient possible de mieux les gérer, ce qui contribue à améliorer l'efficacité de ces nouvelles formes flexibles de transactions technologiques au niveau international.

# REMERCIEMENTS

La réalisation de ce rapport n'aurait pu être possible sans l'appui de certaines personnes que je souhaite remercier.

Le directeur de cette recherche, le professeur Jean Bernard Carrière, de l'Université du Québec à Trois-Rivières, qui n'a pas ménagé son temps, ses conseils et ses efforts afin de me permettre de traverser les étapes plus difficiles. La très grande disponibilité dont il a fait preuve, sa patience et ses encouragements méritent d'être appréciés à leur juste valeur. De même, je tiens à remercier les professeurs André Belley et Denis Pettigrew de l'Université du Québec à Trois-Rivières pour leurs précieux conseils en tant que lecteurs.

Je désire aussi remercier ma famille et mes amis, qui ont fortement contribué à la réussite de ce projet.

Finalement, je voudrais remercier les personnes qui ont aimablement répondu à mon questionnaire ainsi qu'à l'ambassade de l'Inde au Canada pour avoir fourni les informations essentielles à ce projet.

# LIST OF TABLES

# LIST OF FIGURES

# TABLE OF MATERIALS

# INTRODUCTION

The main objective of this research is to analyze the management and technological processes involved in technology transfers between Indian and Canadian firms.

The countries that are now industrialized have attained advanced technological frontiers. The technical knowledge available in the developed countries can be borrowed and utilized by less developed countries (LDCs). This circumstance, together with the widespread concern of the developed nations to promote development in the LDCs, makes the process of technology transfer a subject of intense interest.

Most of the developing countries are facing serious problems, such as slow growth rate of production, stagnation or very slow growth in the standard of living. As a result, they are constantly looking for new possibilities, new methods and new policy-instruments in order to increase their standard of living and to strengthen their relative position in the world economy. In the LDCs, inflow of foreign technology is expected to increase the size of their domestic industrial development.

The transfer of technology will have an important impact on small and medium-sized enterprises in the Third World. In addition, enterprises

in developing countries will be increasingly keen not only to acquire new technology for immediate practical application, but also to enhance their own skills and capabilities for adapting, maintaining and upgrading the technologies. Thus, it can be predicted that the role and importance of technology transfer will increase quite considerably in the years to come and that there will be a growing variety of forms and arrangements under which this transfer will take place.

In India, the shortage of capital and unavailability of appropriate technologies are some of the main causes of under-development. In the process of economic reforms programs, the Government of India has adopted a gradual approach for opening of the economy. All indications suggest that India is emerging as one of the attractive countries for foreign investment. As Canada has a sound industrial base, it should exploit that opportunity by transferring necessary technologies to India.

Like any other developed country, Canada needs to expand its markets because of the limitation of its domestic market. Many multinational institutions emerged due to severe competition and limited markets at home. For instance, many of the large corporations in industrialized countries found that the local market had become small and saturated, thus they began entering into the international markets. Many found a natural niche of growth in the sale of industrial products on an international scale. The other major advantage of transferring technology to less developed countries was the low labour cost. The slow down of the domestic economic growth in industrialized countries and the opportunity of sharing the

knowledge towards the development, led the multinationals to seek investment opportunities in the developing countries. This analysis of current processes of technology transfers between a developed country, Canada, and a developing country, India, could help many countries to improve their economic situations, as the complexity of international relations and doing business internationally is growing exponentially. Added to this there exists a great difference in cultural and social conditions in each country, thus the applications of the experience of one country cannot be easily implemented in another country.

According to the report of The Conference Board of Canada 1987, Canadian investment presence in India is limited. For the Canadian companies, the information gap and limited awareness about the Indian industries and market are the two critical factors which have resulted in the lack of building a long-term presence in India. The information gap issue is particularly noticeable in trade, and is even more evident in joint venture and technology transfer efforts. The information gap is also reflected in the processes of technology transfer, such as, over payments, legal recourses, royalties, and the choice of local partners.

## Definition:

Technology transfer is defined as the process whereby knowledge in some form transfers from a person or organization who possesses it to another individual or organization who receives it. Technology is generally transmitted in a commercial transaction, although there may be also a development-oriented technology transfer.

The channels of technology transfer can be classified between `direct' and `indirect' transfers. The `direct' transfer is the outright purchase of technology from different sources abroad (like suppliers of machinery and other capital goods, foreign technicians etc.). While, the `indirects' are the active intermediation of a foreign enterprise by means of direct investments, licensing or similar type of arrangements, managerial contracts etc. (White, 1983).

## The technology transfer process:

There have been significant debates about successful technology transfer including the process itself of technology transfer (Balasubramanyam, 1973). This process, which has grown in importance in recent years, has been subject to comparatively little scrutiny. A successful transfer mainly needs more precise and defined process of transfer mechanism in comparison with those of existing ones. Therefore, it is very important to study the overall aspects of technology transfer process with special emphasis on " How can the process of technology transfer be improved? "

The process of technology transfer is defined as the process of identifying and selecting of prospective partners, negotiating with selected foreign partners, developing a personal and business relationship between the partners, financing and financial incentives (including tax considerations) to engage in technology transfer, foreign investment guarantees and insurance, aspects of human resources (like technology

transfer agents, types of human resource development complementary to technology transfer etc.), legal aspects of technology transfer, and government approvals for technology transfer (Dichter et al., 1988).

In fact, the process of technology transfer varies widely whether it takes place between : developed and developed countries, developing and developing countries, and developing and developed countries. Therefore, differences in legal, political, economic, and related socio-cultural characteristics between lenders and borrowers of technology require necessary inquiry for a successful transfer. Thus, when it comes to the question of the exchange between developed and developing countries it needs more elaborate research.

This research focuses on the institutional procedure and local aspects of technology transfer between developed and developing countries. It should be of interest to consultants, trainers and officers in private and Governmental organizations supporting and promoting technology transfer. However, it is intended above all for those owners and managers of smaller enterprises in all industrialized and developing countries who are considering becoming partners in a new technology transfer venture.

# CHAPTER I

## LITERATURE REVIEW

The discussion about the international transfer of technology is increasingly centered around the issues of channels and institutional modes of the transfer. The evidence suggests that the ways and means in which foreign technologies are transmitted into countries may be as important in determining the impact of the transfer as the technology itself (White, 1983).

As more and more LDCs continue to seek foreign and advanced technologies, adequate attention should be given to the planning and implementation process of technology transfer, because some technology transfers have failed due to poor planning and proper implementation (Madu and Jacob, 1989). Developing countries rarely consider technical changes in their national planning, as technology is often viewed by them as a constant. A synthesis was achieved in the same literature which would benefit the participants in technology transfer. The framework focused on a strategic decision making approach to the technology transfer situation.

Through a formalized approach the decision maker can consider several alternatives and plan for the transfer. In fact, the mechanisms and

methods of transfer can offer some guidance to planners involved in technology transfer. Madu and Madu (1988) confirmed that due to a lack of systematic thinking, many LDCs have not been able to achieve successful transfer. Technology transfer has also failed where structural and internal factors operating in LDCs have been ignored. Factors such as different world views held by the people due to their natural habitats, cultural value systems, and socio-political and economic conditions. All these can significantly influence the success of technology transfer (Madu and Jacob, 1989). The suppliers of technology should therefore adapt their strategies to the different local environment.

In viewing technologies as mutually dependent, a framework was developed in that literature, where the selection of partner for technology transfer was also discussed; all these factors can help the decision makers in LDCs to incorporate technology transfer into their national planning efforts.

A few models have been offered to structure the international technology transfer process, ranging from simple general models to more complex models (Boomer et al., 1991). For instance, Samli (1985) proposed a general model of international technology transfer that identified five key components: the sender, the technology, the receiver, the aftermath and the assessment. He argued that the dimensions of geography, culture, economy, people, business and government must be considered for achieving a successful international technology transfer.

Many experts have offered the reasons why the transfer of technology has been unsuccessful so often, and most of them have expressed that there are vast differences between the environment of the developed country and the environment of the LDC, also many times there is a conflict of interest existing between the two countries. Fan (1985) stated that much of the controversy surrounding the issue of technology transfer resulted from the divergent views about the process between the sending country and the recipient country. This divergence appears in terms of goals and objectives, the expected benefit and costs in the short term and long term, the time frame of completion and the basic understanding of technological innovation and its diffusion process. Another research has indicated that the problem of technical compatibility in transfer can be solved only by removing barriers to compatibility and developing incentives to stimulate the technology transfer process (Crantner and Naiman, 1978).

According to Driscoll and Wallender (1974), barriers to compatibility are caused by a lack of communication between the two parties involved in the process of technology transfer.

Another reason for failure in completion is often the LDCs lack of trained personnel and the know-how to implement the technology that has been supplied. A common shortcoming of LDCs is that they do not have the capability to manage or plan for the new technology (Akhafaji, 1986).

Linston (1989) suggested a multiple perspective approach, i.e. technical, organizational, social, and personal or individual, for a technology transfer process. In a similar type of research Robinson (1988) presented a complex model relating factors on both the supply and demand side of international technology transfer process.

Fried and Molnar (1978) proposed a transdisciplinary model for technology transfer that considers man-artifact, task, and setting components of the technology as well as communication, domain, and legitimacy of the social organization. An `Analytical Hierarchy Process' (AHP) model has also been used by some authors (Ramanujam and Saaty, 1981; Madu, 1990) for the process of technology transfer.

To date, the focus of technology transfer efforts has been on the technology itself - the hardware, the systems, the products, and the design (Klein and Crandall, 1991). However, it has become apparent that the availability of advanced technologies does not guarantee successful implementation or user acceptance. For both sides, the propensity to transfer technology is viewed as a function of the perceived cost, the perceived risk, and the anticipated benefits. The choice of technology to be transferred has to take into account the function of the cost of modifying it, the technology leverage factors, the recipient and provider, the government policies, and the local political, economic, and social conditions.

Boomer et al. (1991) attempted to identify specific factors and map out the fit between technology to be transferred and the infrastructure of the recipient country. Work by the Technology Atlas Team (1987), which recognized that "technology is a combination of both the physical tool and the related know-how either to make or use that tool", represents some of the most significant contributions in this area.

According to Al-Ali (1991) technology can be defined as a `method of doing something'. To use a method, there are three essential requirements, e.g. information about the method, the means of carrying it out, and some understanding of the method. For technology to be properly understood or absorbed, the suppliers must provide all of these elements either explicitly or implicitly. He argued that, for an effective and efficient transfer of technology, the recipient must ensure that training clauses are spelled out in detail in technology agreements and local participation must be encouraged.

Thus, the utilization of sophisticated technologies depends on appropriate support for the personnel responsible for implementing, maintaining and using those technologies in the form of technology-specific skills and knowledge, and overall the appropriate transfer of technology to or from the appropriate country.

According to Skowronski (1987), though it is very important, except for a few guidelines, there seems to be no general framework for the process of technology transfer, whereby the process is undertaken in the

context of an international market-entry strategy based on recipient-firm, selling-firm, market, technology and other agreement-specific variables. Transfer implies a process linking the technology supplier to the technology user. How technology is transferred depends on the type of technology and regulatory restrains, the size of market, the sophistication of the user, and the costs and benefits of the supplier and user (Driscoll and Wallender, 1974).

Recent research has attempted to identify such specific factors that fit between two countries mutual understanding and interest and, also to reveal the process of successful technology transfer.

## Forms of technology:

In its most fundamental form technology can be defined as a specific form of normative knowledge directed towards expanding or replacing a given human activity, its results being the ability to make or use artifacts. This highlights the facts that though technology can sometimes be materialized as a final product, a service, that product or service is first embodied as a design which itself follows from an existent technical knowledge. In fact, the final form can be the specific design or technical knowledge that is created by organization (Carrière, 1992).

Technology transfer may be embodied in physical assets such as machinery, in the services of skilled manpower and in patented and non-patented technology. This may also be disembodied in the form of new improved production processes, or new concepts, finished products,

drawings, technological lines and complete industrial projects, or management and work methods and organization.

`Disembodied' technology refers to factors affecting productivity that are not associated with changes in capital stock. Examples of this would include technical assistance to improve capacity utilization, operating performance, and maintenance procedures. `Disembodied' technology covers the transfer of technical skills necessary for the optimal operation of capital stock.

`Disembodied' technology is sometimes broken down into two categories. The first category described above refers to the application of proper `technical assistance' to maximize productive capital stock. One can also think of `disembodied' technology, in terms of organizational assistance. This refers to transferring the skills necessary for organizing production correctly, for procuring the raw materials and other components used in a timely and cost-effective manner, for assembling an inventory of adequate spare parts, and for adequate administration and for the financial ability to set prices and manage cash flows. It is useful for discussion purposes to separate `disembodied' technology into the ability relating to technical and to organization skills (Husband, 1991).

`Embodied' technological change is associated with the introduction of new or different machinery and equipment, and the supply of spare parts as needed. While `disembodied' technology can make significant short-term contributions to productivity increases, most technological progress occurs

in conjunction with the introduction of new machinery and equipment (Husband, 1991).

The question of technology choice is influenced by the special `technology environment' present in developing country. Regardless of the choice of technology the transfer necessitates a combination of documentation, training, learning visits, equipment, market, organizational planning and personnel selection. The major mechanism through which the transfer of technology may take place are: import of machinery, licensing and know-how agreements, leasing, joint venture (Skowronski, 1987). Therefore, technology transfer can be defined as a business transaction or relation in which technology is sold, bought or exchanged in a more or less tangible form (knowledge/ process or product/services) between parties in order to attain the respective strategic objectives (Carrière, 1992).

Furthermore, the arrangements governing the transfer of technology, through direct foreign investments, or joint ventures, or licensing agreements, usually include conditions such as restrictions on export, type of imports, restriction on research and development, and on diffusion of technology. However, prerequisites of a successful transfer include, the common acceptance of profitability as a criterion of success, an agreement of the purpose for which the transfer is being undertaken and the benefits to both parties in the long run no matter which mechanism is chosen (Skowronski, 1987).

Successful transfer of technology requires the understanding of the socio-economic and cultural value systems of developing countries. The decision-maker has to consider all the possible factors that may influence the technology transfer decision-making process. Technology transfer decision making should consider all the components of the process and also consider the capabilities and potential capabilities of the country (Madu and Jacob, 1989).

A program of technology transfer should include a mechanism which effectively links or couples the source of knowledge with the eventual utilization of that knowledge.

The transfer mechanism is not merely a series of communications channels through which information flows. It is human resources mechanism which can be incorporated into either the supplier or the user environment.

From the previous literature review a theoretical framework has been constructed for this research.

## Theoretical framework:

In our research, a plan is developed with a set of guidelines and standards on how to transfer technology. This plan includes a procedural sequence of transfer: selection of partner, the role of Government, education and training of the local workforce, development of the management process, implementation phases, etc. The plans, thus developed will help in achieving the goals of technology transfer. Through the

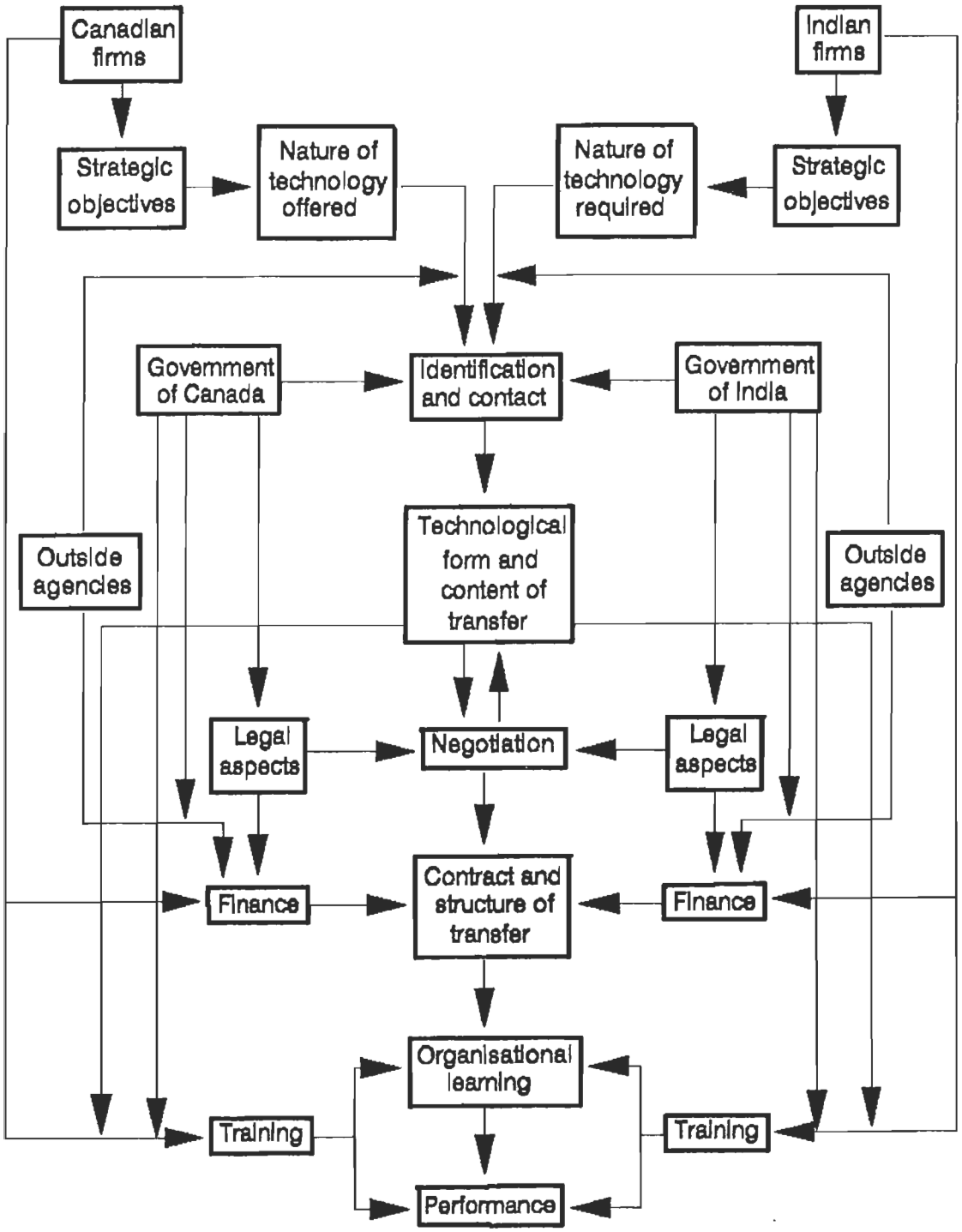
guidelines and standards set, a control exists for assessing the successes or failures of the transfer.

Figure 1 shows a theoretical framework of key factors involved in the technology transfer process. Considering a foreign collaboration, the firms must decide their goals or strategic objectives. Successful technology transfer requires that both supplier and receiver of technology have some compatible goals and objectives. Often this compatibility is not achieved due to conflicts that may not have been resolved before technology is transferred. Incompatibility in some crucial goals between two parties may also be the cause for some of the failures of technology transfer. According to their objectives they should proceed or enter into the technology transfer agreement.

The figure distinguishes two firms (Canadian and Indian) whose strategic objectives are different from each others. According to their objectives, Indian firms require technology whereas Canadian firms possess technology which they are willing to transfer to reach their goals.

In thinking through their goals, they should consider the nature of the technology that is to be transferred or required and what kind of country would be the best suited for it. Part of the task of the firm is to identify the appropriate technology to transfer and also the potential supplier. In order to achieve this task, the team must define the firm's objectives and resources in relation to the technologies being considered.

Figure 1. Process of technology transfer between Canadian and Indian firms



Thus, a firm must have some recognized goal structure before it is able to take a coordinated set of actions regarding the transfer of technology. Once the objectives are well defined and all the capabilities and limitations (strengths and weaknesses) of the firm are well understood a firm can engage itself in a technology transfer process.

## Identification and contact:

The selection of a foreign partner is not only one of the most important, but also one of the most difficult steps. Mutual confidence and mutual understanding of goals are essential. As the model shows, at this stage governments of both countries or outside agencies may provide information on potential partners from both countries.

## Technical form and content:

After the stage of identification and contact is over, the technological forms and content must be taken into consideration. Irrespective of their existing knowledge resources, importers' short-term and long-term objectives influence their approach to knowledge acquisition. For example, some importers may have objectives which are limited to achieving modest production performance levels and which assume a continuing dependence on external services to achieve these objectives. At the other extreme, some importers may have objectives that involve mastering and subsequently adapting and improving the acquired technology. These different performance objectives, translated into objectives for knowledge acquisition, clearly imply a range of levels of demand for technological content (Deshai, 1988).

The agreement which is most appropriate depends upon what the needs and abilities of a given firm are to satisfy those needs. Moreover, the kind of agreement that is the most suitable depends on the intentions of the parties.

If the channels and mechanisms for knowledge supply and acquisition are not effective, the actual technological content will fall short of the planned content. For example, if the supplier cannot develop adequate documentation or well organized training activities, the supply of knowledge may be constrained. Similarly, the importer may make inadequate efforts to acquire and absorb the knowledge: for example, by sending too few or unprepared personnel for too short a period of training. In summary, the technological content of collaboration is variable. If this flow is to extend beyond transfer of the minimum set of knowledge required to support immediate production objectives, that must be acceptable to the supplier in principle, and sought by the importer in practice, it must also be negotiated over, and its transfer planned and organized by both (Deshai, 1988).

**Negotiation:**

The following step is the negotiation. The negotiation process determines the basic aspect of transfer, the start-up and learning period involving the principals in the arrangements, the strategic fit of the venture, and the character of agreements. Although the technological form and the content of transfer have generally been decided by the parties

before coming to negotiation, it is most probable to change during the process of negotiation because of the intention of both parties to maximize the gain from the transaction process. However, the ultimate gain depends on the bargaining capacities of both parties.

Negotiation and agreement over the technical system encompassed by a technology transfer contract is one thing; negotiation and agreement over the planned technological content is another. If the technology importer actively pursues objectives about knowledge acquisition, then the technological content must be explicitly negotiated. But, if such clear objectives are absent, technological content will be determined implicitly by negotiation over other issues (e.g., the payment to be made), and left to the decision of the supplier.

Technological content can be limited either because the issue is not explicitly negotiated or because the level of payment lead the suppliers to restrict the amount of assistance they were to provide.

In the negotiation phase, each party should take into account the other's request to include in the agreement. The items such as use of locally available resources, specific provisions for the use of locally available materials, technologies, technical skills, consultancy and engineering services and other resources, specific provision for and other resources, specific provision for the rendering of technical services in the introduction and operation of the technology to be transferred, etc., must be explicitly negotiated.

In this step, the mode of payments also comes into question and decisions must be taken in that respect. The negotiation process is generally influenced by the governments of both parties and by other outside agencies. Moreover, some legal aspects should also be taken into consideration.

**Implementation of technology:**

At the end of the negotiation, there is the final signing of the contract and implementation of technology. However, the whole process is affected by the financial capabilities of the firms and the legal rules and regulations of each country. As the financial question comes, the whole process could be financed by firms themselves or could be arranged by the financial package with the government or other development agencies (referred as outside agencies). The figure shows the necessary relationships of the process.

**Legal aspect:**

A wide range of national and international laws and policies has an impact on access to technology and return on investment.

Members of the international community are engaged in dialogue in a number of multilateral forums. At the United Nations dialogue between developed and developing countries, the `North-South Dialogue', has been focused on achieving an appropriate balance between ensuring that the South has access to technology so necessary for development, and ensuring that

the interests of technology suppliers and innovators are adequately protected (Szibbo, 1984).

At the United Nations Conference on Trade and Development (UNCTAD) and at the Organization for Economic Cooperation and Development (the OECD) attention has also been focused on encouraging transfers of technology in a manner that avoid the imposition of unnecessary, anti-competitive conditions on such transfers.

At the World International Property Organization (WIPO), developing countries have shown increasing concern that international patent system may not be serving an optimum role in assisting them in acquiring new technology.

National laws and policies clearly have an impact on the transfer of technology. Canadian and foreign laws on competitive policy, export controls, trade practices and incoming investments may affect the terms and conditions of an international transfer. The extent to which one country's laws purport to reach persons or conduct in the territory of another country must also be considered (Szibbo, 1984).

In the views of many developing countries, the unequal bargaining power of the transferor of technology suggests that terms and conditions actually imposed have often been discriminatory and restrictive. Some conditions are seen as an anti-competitive for private companies. Others, such as restricted export market terms, are viewed as extensions of

protectionist policies. In either cases, the label of `restrictive business practices' has taken on expanded meaning for developing countries.

Measures on regulation of the flow and effects of transfer of technology, finance and technical aspects of technology transactions may deal with:

a) Currency regulations of foreign exchange payments and remittances;

b) Conditions of domestic credit and financing facilities;

c) Transferability of payment;

d) Tax treatment;

e) Pricing policies.

**Training:**

As training is a vehicle for the transfer of technology, training must be arranged by both the supplier and the receiver. Training arrangements are sometimes drawn up in the content of technology in order to guarantee an effective transfer as well as successful absorption and adaptation of the relevant technology. Once again, governments or agencies could come into the picture to execute the training.

**Evaluation:**

Now, the evaluation of the transfer can be done as part of the process. The last two dimensions of the model, i.e. the organizational learning and the performance, enable the firm to evaluate the total project.

Evaluation of technology transfer is an important part of the total process. Sound results require a practical approach. It can be a complicated process. There is no single correct way for technology transfer evaluation, but rather there is a wide variety of techniques (O'Keefe, 1982).

Characteristically, evaluation procedures are consistently time consuming, and difficult to conduct. In the face of these problems, it is essential to have a clear understanding of the importance of evaluation.

In addition, to determine success or failure of a technology transfer program, evaluation is important for better motivation, greater knowledge, improved decisions (O'Keefe, 1982). Evaluation provides the knowledge about how effective or efficient it is and about its strengths and weaknesses. It also helps to determine the best methods, set goals and standards.

Evaluating a technology transfer program is a process which can be designed in many different ways. It is important to note that there is no single way to develop an evaluation. Rather, different evaluation procedures could all lead to a satisfactory result depending on the circumstances.

In the overall model, some aspects are repeated because of their structural differences. When two different countries are taken into

consideration, generally their legal structure, as well as financial structure, training procedure in respect of technology transfer must vary significantly. Above all, the combination of all these aspects can influence the whole process.

## I.1. SPECIFIC OBJECTIVES OF THE RESEARCH PROJECT

The technology transfer is a complex process which requires clear definition to ensure that both the seller and the purchaser of technology clearly understand its implications, and try to maximize the benefits for both.

There are several general problems which hinder the transfer of technology to developing countries. For example, firstly there is a lot of misinformation or lack of information on the part of both the supplier and the recipient, secondly there are legal restrictions imposed by the government of developing countries, thirdly the financial arrangements between the negotiating parties, are the most important ones of the problems(Dichter et al., 1988).

In this research we try to make information available to Canadian and Indian firms regarding the possible steps involved, and the procedure involved in developing and implementing a technology transfer agreement.

Finally, this research will try to identify the key factors that initiate the success of the technology transfer agreement between developing and developed countries from the standpoint of the Indian and Canadian firms that have already entered into the transferring process.

# CHAPTER II

## RESEARCH METHODOLOGY

This chapter will present the research methodology, i.e. research design, data collection, survey instrument and data analysis.

Research methods for this study contained both primary and secondary sources. An extensive literature survey was conducted on technology transfer process. Surveys of the Indian High Commission, Ottawa, and the Chamber of Commerce, Ottawa were accessed.

The present study, results have been obtained through interviews and responses by mail by means of a questionnaire with some twenty seven Indian and Canadian firms. The general analysis of the results helps to define the process of technology transfer.

### Research design:

Literature survey reveals that no similar research was conducted so far regarding the process of technology transfer between Canada and India. As a result, our present research aimed at the study on the process relating to technology transfer between Canada and India. However, in this research we not only tried to accumulate information, but also we tried to

identify the problems and opportunities regarding the process of technology transfer between those two countries. Thus, it is an exploratory research and descriptive in nature.

## Sampling:

The sampling of this research is composed of 27 collaborative enterprises who engaged in technology transfer between Canada and India during the years 1981 to 1991. Among them 13 are Canadian and 14 are Indian firms. These enterprises are selected because they are more recently engaged in the transferring process. The list of the enterprises was furnished by the High Commission of India, Ottawa.

Although the High Commission of India, Ottawa, provided the list of 100 collaborative enterprises, some of them were eliminated because of the unavailability of addresses. The questionnaire was mailed to 40 Indian and 30 Canadian enterprises, i.e. altogether 70, of these 27 enterprises responded, which represents a return rate of 38.5%.

## Data collection:

Both India and Canada are two vast countries, and the enterprises are spread all over India and Canada. Moreover, India is a diversified country, where different enterprises in different region face different kinds of advantages or disadvantages because of the diverse political and economic situations. Responses from different parts of country helped to reduce sampling error.

On the Indian side, Calcutta was chosen for the personal interviews. That covered 12 enterprises in India. For the remaining Indian and all Canadian firms, questionnaires were sent by mail, in order to conduct a time and cost effective survey.

**Survey instrument:**

The questionnaire (annex 1) is used for collecting the information about the factors affecting the technology transfer process. Apart from general information, the questionnaire contains ten different variables of process of technology transfer: identification and contact; strategic objectives; technological forms and content; negotiation; role of outside agencies; finance; training; legal aspects; organizational learning, and performance.

Each part contains pertinent queries about the variable in question. This questionnaire is composed of some closed and some open-ended questions. The open-ended questions are used to obtain more specific information.

In case of closed questions, some questions are dichotomous in nature and some are asked on a five point scale, such as not important to very important or not at all to very much, depending on the nature of the question.

## Data analysis:

The data analysis was started by the codification of answers to clarify the choice of responses. The SPSS Statistical Algorithm was used to analyze the data. This method was chosen because of its flexibility and performance on the statistical analysis. The descriptive statistics, like frequencies, percentages, means and standard deviations, were computed to realize the nature of our samples.

The chi-square test was done to analyze the significant differences of responses between two groups, i.e. the Canadian firms and the Indian firms. The chi-square distribution test helped us to identify the technology variables which were significantly related to the level of performance of the firms.

# CHAPTER III

# RESULTS AND DISCUSSION

## III.1. GENERAL INFORMATION

In this section, we will first discuss the general information of the respondent firms. In this research 27 firms responded to our questionnaire. Among them 13 are Canadian companies and 14 are Indian. In the process we found that all Canadian companies are the suppliers of technology, while Indian companies are the recipients. A brief profile of the firms in two countries, e.g. Canada and India based on the interview results is listed in Table 1. In this Table data are summarized into ownership, sectorial distribution and sizes of these enterprises. Apart from the type of ownership, main products and size of the firms will be discussed thoroughly later on, we also inquired about a few other aspects, such as foreign transactions, and research and development activities (R & D).

## Brief profile of the firms:

### Ownership:

Table 1 reveals that out of the total 27 firms in both countries, the private ownership represents 55.6% of the firm, while public ownership represents 44.4%. However, on the Canadian side, the private sector firms are more numerous, i.e. 33.4%, as compared to those in India, 22.2%. On the other hand, in our sample there are only 30.7% Canadian public sector firms involved in technology transfer activities with India, whereas the number of Indian public sector involvement is 57%.

### Canadian firms:

There are 5 out of 13, i.e. 38.5% that fall into service sector. Industrial equipment sector comprises 23%. Each of the telecommunication and chemical sector comprises 15.4% of total Canadian firms. Only one firm, i.e. 7.7% falls into the mining sector.

### Indian firms:

There are 28.6% firms are in the industrial sector. 11.1% firms are from mining sector. Environmental, telecommunication and chemical sector each has the same weight, i.e. 14.3% of total Indian firms. However, the shipbuilding sector has only one firm.

## Table 1

Brief profile of the firms

| Characteristics | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| **Type of ownership:** | | | | | | |
| Private | 15 | 56.6 | 9 | 33.4 (69.3) | 6 | 22.2 (42.9) |
| Public | 12 | 44.4 | 4 | 14.8 (30.7) | 8 | 29.6 (57.1) |
| **Sector:** | | | | | | |
| Environmental | 2 | 7.4 | - | - | 2 | 7.4 (14.3) |
| Mining | 4 | 14.8 | 1 | 3.7 (7.7) | 3 | 11.1 (21.4) |
| Telecommunication | 4 | 14.8 | 2 | 7.4 (15.4) | 2 | 7.4 (14.3) |
| Shipbuilding | 1 | 3.7 | - | - | 1 | 3.7 (7.1) |
| Chemical | 4 | 14.8 | 2 | 7.4 (15.4) | 2 | 7.4 (14.3) |
| Industrial equipment | 7 | 25.9 | 3 | 11.1 (23.0) | 4 | 14.8 (28.6) |
| Services | 5 | 18.5 | 5 | 18.5 (38.5) | - | - |

**Table 1** (continued)

Brief profile of the firms

| Characteristics | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| **Size:** | | | | | | |
| Employees: | | | | | | |
| Small | | | | | | |
| 0 - 25 | 6 | 22.2 | 5 | 18.5 (38.5) | 1 | 3.7 (7.1) |
| 25 - 50 | 1 | 3.7 | - | - | 1 | 3.7 (7.1) |
| 50 - 100 | 4 | 14.8 | 2 | 7.4 (15.5) | 2 | 7.4 (14.3) |
| Medium | | | | | | |
| 100 - 200 | - | - | - | - | - | - |
| 200 - 400 | 3 | 11.1 | 1 | 3.7 (7.7) | 2 | 7.4 (14.3) |
| Medium to large | | | | | | |
| 400 - 600 | 5 | 18.5 | 4 | 14.8 (30.7) | 1 | 3.7 (7.1) |
| 600-1000 | 2 | 7.4 | - | - | 2 | 7.4 (14.3) |
| Large | | | | | | |
| >1000 | 6 | 22.2 | 1 | 3.7 (7.7) | 5 | 18.5 (35.7) |

Note: The percentage in parentheses represents the percentage share relating to particular country.

## Sectors:

The 27 firms which were interviewed spread across the various industrial sectors, e.g. environmental, mining, telecommunication, shipbuilding, chemical, industrial equipment, and services. We will now look at the composition of each of the sectors.

1) Industrial equipment sector: There are total 25.9% firms which are producers of industrial equipment. Among them 14.8% (4 firms) are Indian. Out of these 4 companies, first one is the manufacturer of mobile cranes, generator sets and spare parts. Second one is the manufacturer of industrial furnaces, combustion equipment and their accessories, and foundry equipment. The third is making components for photo-copying machines. The last one is the manufacturer of tower parts, extruder for aluminum and alloy, forging of aluminum, and alloy products.

In Canada, one company is the manufacturer of belt furnace, compact mesh belt furnace and fluidized bed furnace. The second one is manufacturing edible oil refining equipment, and last one is the manufacturer of power products and power equipment.

2) Service sector: There are 18.5% (5) Canadian firms that are in the service sector. Three cases of technology transfers have taken place in the consulting engineering firms, and one has occurred in the consulting service in electricity, and the remaining one has occurred in the service division of geoscience.

3) Telecommunication sector: 14.8% (4) firms deal with the telecommunication sector. The main products of the two Indian firms are remote sensing data interpretation, tungsten filament, digital microwave systems, mini-computer/microprocessor based system. One Canadian company produces mainly schorber roles and microwave components and another is the producer of printed circuit boards.

4) Mining sector: 14.8% (4) firms are in mining. Three of them, one Canadian and two Indian, are producers of aluminum products, and the fourth one in coal business in India.

5) Chemical sector: The Chemical sector involved 14.8% (4) firms, two from each country. In India, one is the maker of different kinds of resins and the other is the manufacturer of bicycle tire. In Canada, one is a producer of the bicycle tires who is the technology supplier to Indian bicycle tire company. The second one is in the business of waterproofing, acid resistant flooring and surfacing concrete.

6) Environmental sector: There are 7.4% (2) firms in the environmental sector which mainly deal with the industrial water treatment.

7) Shipbuilding sector: There is only one Indian firm that falls in the shipbuilding sector in the sample.

**Firm size:**

Table 1 shows that 38.5% Canadian enterprises have less than 25 employees, whereas the same percentage of Indian companies have more than 1000 employees. On the Canadian side, it can be said that there are 53.9% small industries, 38.5% medium sized, and 7.6% large firms. On the Indian side, there are only 28.6% firms having less than 100 employees. 21.4% medium sized firms, and 35.7% large firms. It is obvious from this table that technology transfer in our sample is more frequent in two extremes, i.e. either in the small sized firms, i.e. size of 0-25, or in the large sized firms, i.e. >1000. In Canada, the small firms are more active, i.e. 38.5% compared to those in India, i.e. 7.1%. For large firms, the picture is completely different, i.e. Canada has only 7.7% firms, but India has 35.7% firms.

The definition of small and medium sized enterprises is to be measured by the same scale in both countries. This research is dealing with two totally different countries, India, a developing country, Canada, a developed country, wherein the structural differences are huge. India still has a labour intensive economy, where as Canada has an automated, capitalistic economy. Thus, when we describe (define) the size of an enterprise we take into consideration the number of employees in the enterprise, however this question has to be dealt with great care. Therefore, in this research, we define small firms as those having fewer than 100 employees; medium-sized firms as those having 100-600 employees; medium to large-sized firms are those with 600-1000 employees; and large firms are those with more than 1,000 employees.

**Foreign transactions:**

The history of foreign transactions for each one of the firms prior to this present technology transfer process can be seen by the ratio of export to total sales ratio, and the exporting country destination. It has been found that among 14 Indian companies, 57.1% of them did not have any experience about the foreign transactions earlier. On the Indian side only 42.8% companies are exporting their products. The amount of exports of 21.4% companies comprises a very small percentage of their total sales. Two of the companies are exporting more than 50% of their products abroad, and the last one has 100% export oriented business.

The companies, particularly those engaged in very little export business, are dealing with very close neighbouring countries. However, from time to time they extend their business into south-east Asia and the Middle east countries. The trend follows that when they increase their volume of export, they start moving far away, like Europe or North America or towards more developed countries. The export oriented business-based companies are exporting in North America, Australia and Japan.

Of the 13 respondent firms in Canada, twelve or 92.3% are already engaged in export business. In fact, we can say that 53.8% of them are export-based industries, because their export to total sales ratio varies from 85% to 100%. For 23% companies, this ratio is 60%. However, two companies export only 25% of their products. The last one did not reveal its actual position in respect to export.

Canadian companies exports are destined to countries distributed worldwide. As far as export to foreign countries is concerned, one company's export zone is worldwide, exports of two other companies goes from developed countries, like U.S.A., Japan and U.K., to developing or third World countries. Actually, a major part of their export goes to developing or third World countries, like India, Taiwan, Saudi Arabia, Mexico, Brazil, and other parts of Asia, Europe and South America. Only one company's business partner is U.S.A.

Unlike Indian companies, most of the Canadian companies do have experience dealing with foreign companies. Hence the, present technology transfer is not new to them. Moreover, most of them are already doing business with developing countries, like India, and in some cases India is already an existing business partner.

**Research and development activities (R & D):**

A total of 70.4% of the firms in the sample have their own R & D departments, with Canada (76.9%),and India (64.3%). Although it was expected that a developed country, like Canada may have more companies with R & D departments as compared to those in a developing country, like India, the difference in R & D activities between the two countries is only 12.6% of firms. One must say however that in both cases, companies were involved in a technology transfer which takes into consideration that they had developed their own technology with their own R & D.

Among 76.9% (10) firms in Canada 60% (6) of them have large R & D departments, whereas the other 40% (4) companies' R & D departments comprise only 2 or 3 employees each. As far as the large R & D departments of the Canadian firms are concerned 30% (3) of them have about 35 employees each in their R & D department. One firm has 70 R & D employees. Another one has 600 technicians and engineers, while one multinational has 3000 employees in its R & D section.

In case of the Indian firms, 44.4% (4) of them have large R & D departments, and the remaining 55.5% (5) have very small R & D departments. Of the Indian firm, with large R & D department has 1,200 employees, and the two others have about 200 employees each, the last one has about 100 employees. In case of the small firms, the number of R & D employees varies from 2 to 10.

However, almost 92.8% of the Indian companies are engaged in development activities whether they have their own R & D or not. Interestingly, the companies that do not have their own R & D, are trying to improve their product by upgrading designs based on their customers' requirements. Survey shows that this is not the case for Canadian companies. The companies that do not have their R & D departments, are not at all involved in any kind of technical development activities.

## III.2. TYPES OF TECHNICAL AGREEMENTS

The 27 technical transfer agreements listed in Table 1, are classified into three main types:

1) Technical collaboration agreements;

2) Sale to a subsidiary;

3) Joint venture.

### 1) Technical collaboration agreement:

Technical collaboration agreements is a term containing a wide variety of clauses or contractual agreements between a foreign firm and a local firm for effecting technical transfers. "Broadly, an international technical collaboration agreement can be defined as a contractual agreement between two functioning entities of different nationalities for the sale and purchase of a wide variety of technical know-how" (Balasubramanyam, 1973). An alternate definition provided by J.S. Fforde (1957) who captures the legal and financial arrangements that characterize these agreements. He describes it as "an agreement between a foreign and an entity created under local law and owned by local public or private interests, in which the foreigner provides management services, technical information, or both, and receives payment in money".

## 2) Sale to subsidiary:

A subsidiary is defined as a firm incorporated in India where the majority control (more than 50% of the total capital) rests in the hands of a foreign firms. Thus, the subsidiary receives the know-how from its parent firm irrespective of the fact, whether it does or does not enter into a formal agreement.

## 3) Joint venture:

The characteristic features of joint venture are the sharing of control over operations and the ownership of capital by both parties involved. The definition is given by Tomlinson (1970) who captures the essential features of these arrangement: "A joint venture is one where there is the commitment, for more than a short duration, of funds, facilities, and services by two or more legally separate interests, to an enterprise for their mutual benefit".

Thus unlike the case of the technical collaboration agreement, in the joint venture, the foreign firm's interests are closely related to those of the partner firms.

## Survey results:

Table 2 shows the nature of foreign technical transfer agreements. It shows that out of 27 firms 66.7% are technical sales agreements between two independent firms, whereas 22.2% are joint ventures, and only 11.1% are

sales to a subsidiary. It certainly shows a preference for non-financial participation in the Indian economy on the part of the foreign

**Table 2**

Nature of business relation

| Characteris-tics | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Technical collaboration | 18 | 66.7 | 9 | 33.3 | 9 | 33.3 |
| Joint venture | 6 | 22.2 | 3 | 11.1 | 3 | 11.1 |
| Sales to a subsidiary | 3 | 11.1 | 1 | 3.7 | 2 | 7.4 |

firms. Thus, though hybrid forms of participation have occurred, pure technical collaboration agreements have been the most important forms of foreign participation.

The foregoing review shows that technical collaboration agreements have become more frequent. The foreign firms are finding that technical collaboration agreements are preferable and feasible in the light of the modern Indian economic situation. Lack of adequate finance and knowledge about local markets and institutions had motivated a foreign firm's entering into a technical collaboration situation. The need to cope with Indian official rules and regulations was another important factor influencing these firms entering into technical collaboration with Indian firms rather than embarking on direct investment ventures.

For foreign firms, a technical collaboration agreement also helped to explore the local market for future investments. It provided the necessary market knowledge about Indian business conditions needed for a deeper involvement.

## III.3. FOREIGN PARTNER SELECTION

### Introduction:

The next step of the transferring process according to our theoretical framework is to select the right partner. As in every contractual relationship, the qualities of both parties should include a willingness to act in good faith, a perception of a `win-win' situation, the ability to recognize each other's viewpoint and concerns, and a desire to have a formal agreement setting out specifics for a long-term relation (Government of Canada, 1986). It is fundamentally important to choose the right party to participate in a technology transfer. A well-drafted contract with a poorly-chosen contracting party can lead to failure even if the technology is appropriate. Parties must work together and co-operate for common goals in order to achieve a successful technology transfer. The parties should be complementary, seeking mutual objectives and indicating a desire to co-operate for the success of the project. There should be no conflict of interests. Mutual confidence and mutual understanding of goals are essential.

Before engaging themselves in a technology transfer process a review of the suppliers' or the recipients' background could be made. The recipients can check the ownership of the suppliers, their managerial structure, reputation of the suppliers' technology and their product,

availability of support from the suppliers for providing documentation, meeting local requirements, providing future technology improvements, consulting services and managerial assistance. They can also make an investigation of suppliers' financial background legal status of the ownership of the technology, and if possible, licenses and assignments granted in the past by the suppliers and a summary of those terms and conditions which will affect the recipients (Government of Canada, 1986).

In the case of suppliers, their investigation could be done in the following areas. They should check the recipients' managerial structure, personal competence, educational level and capacity, technical awareness and knowledge. Those are the resources which the recipients will require in order to establish itself as a viable user of the technology. Additional resources, like the availability of resources, equipment and machinery, level of quality and manufacturing capacity, research capacity and local availability of educational and vocational training the recipients will require along with above one. If that technology transfer is to expand their market share, then they should investigate about the markets, market share and forecast patterns of change, potential for conflicts due to serving the same customers (Government of Canada, 1986).

These types of relation become more difficult in an international situation where differences in culture, language and way of life are huge. The entrepreneur in the developing country is literally the key which can make the venture work or not. If the entrepreneur does not have the will, the patience and resourcefulness, the venture simply will not work.

Prospective suppliers and recipients of technology come into contact after an extensive research. They could come into contact by correspondence by mail or by advertising in newspapers and trade magazines. Embassies, consulates, and chambers of commerce may provide information on prospective suppliers or recipients. Financial institutions may provide information to their customers concerning the customers' technology projects. Various government bodies, specific trade and industry associations may also be approached for assistance in arranging meeting between parties interested in the technology transfer.

The United Nations and its specialized agencies can also provide information about specific business opportunities available in the developing countries. The United Nations Conference on Trade and Development (UNCTAD) and the United Nations Industrial Development Organization (UNIDO) have taken a special interest in technology transfer. They have established institutional supports to promote and facilitate such activity.

Sometimes prospective suppliers and recipients may come into contact through an accidental meeting. Often business people from developing countries come to international workshops, industry meeting, trade or development conferences, and university seminars to acquaint themselves with the latest developments in their field. Entrepreneurs can meet potential foreign collaborators there. Often Third World Entrepreneur visit prospective foreign business collaborators to propose a joint venture.

Finally, if a business person from a developing country has relatives in an industrialized country who are engaged in business, the technology can be transferred through these persons. These types of contacts can be referred to as informal contacts.

## Survey results:

Our survey shows that 70.4% of the sample agreements had been initiated by the Indian firms (as shown in Table 3). It so happened that Indian firms were looking for technology they needed and they identified the Canadian firms as the possible suppliers. Only 22.2% of the cases, Canadian firms took clear initiative to transfer the technology into India. The remaining 7.4% were involved in the process through the initiation by a third party. In one case it was done through a local consultant. In another case it was done very informally by an immigrant, living in Canada, who took the initiative to make the contact.

**Table 3**

Initial contact

| | Frequency | % |
|---|---|---|
| Indian firms | 19 | 70.4 |
| Canadian firms | 6 | 22.2 |
| Others | 2 | 7.4 |

25.9% of the cases involve intermediaries in the process of identifying or selecting the partner. Among these cases, 18.5% are other firms that have got involved in the process. In case of the Canadian entrepreneurs, they approached through the firms already established in India and a longer period of presence, competence and reputation in India. In their respective fields and positions they also had good contacts in the Indian market.

Apart from the above-mentioned cases, in all other cases the contacts were made by the personnel of the firms themselves. In most of the Indian cases, the entrepreneurs attended conferences, where they came to look for their prospective partners. However, in a few cases, the identification was done through journals. Our survey shows that the identification was mainly linked to the technology needed. Indian entrepreneurs were searching for the technology, and they picked it up where it was available. The superiority of the technology and its compatibility with Indian equipment were the factors on which the selection was made.

After selecting the technology, the entrepreneurs visited the industry, and later most of the work was carried out by mail or by telephone. In fact, the main form of contact was done through visits and by correspondence, though, the visit was not the essential form of contact. In our survey, 60.3% cases showed that the entrepreneur visited the enterprise in the other country, whereas in the remaining 39.7% cases, no visit were undertaken by the personnel. Starting from the identification and contact

to the technology transfer, all the processes and paper-work were done by mail and telephone calls.

In the majority of these cases, the Indian firms had taken the initiative in acquiring the technology in order to solve particular problems or to seize the opportunities to compete in the Indian market. In all these cases, action of exploring the technology was taken by the supplier in response to the need expressed by the corresponding entrepreneur in India. Thus, we can say that the imported technology appeared in India because it had been `technologically pulled' in by the Indian firm, and not because it had been `market pushed' there by the supplier.

## III.4. OBJECTIVES OF THE TRANSFER

### Introduction:

In this chapter we will focus on the firms' objectives. We explored the nature of their objectives by inquiring about the reasons why they intended to enter into collaboration.

Obviously, the suppliers would rarely attach high importance to a single or specific type of objective. They in fact, approached to collaborate with a `portfolio' of different objectives. In most cases, these objectives were ranked according to their relative importance, and they could have been changed during the approach to collaborate. However, the fact remains that objectives are categorized into two main groups, e.g. technical objectives and market objectives.

Although both the Indian and the Canadian firms have responded to both objectives, it is likely that the Indian firms are more inclined towards the technological objectives, whereas the Canadian firms are inclined towards reaching the market objectives.

The survey included close-ended questions on a scale of five for both objectives. For each of them, the five scale points were: `not important', `little important', `average', `important' and `very important'. The Mean represents the mean response for the five scale answer

for each objective. More clearly, if the mean is more than or close to 4, the objective is `very important', and if it is around 3, the response is average. If mean is near 1, it is not important to all the firms who responded to that particular question. However, the `mean' for `total' cases where it represents Canada and India together does not reveal the actual situation. As the two different countries have different motives for collaboration, the statistics for Canada and India, separately, reveal the situation more clearly and correctly.

## Survey results:

The `technical' objectives are divided into 8 groups. Table 4 shows all the divisions and all the cases for each group, and their means and standard deviations. Table 4 shows that almost all Indian companies emphasized on the importance of increase in technical learning. The mean is 4.5 and S.D. is 0.7. This confirms that one of the most important aims of technology transfer agreements for recipient Indian firms is the acceleration of their own technical development, i.e. the learning and application of new technologies. Recognition of the importance of raising technological capabilities in that respect was emphasized practically by all the enterprises which were being interviewed.

The next important objective is improvement of the quality of their existing products, where mean is 4.1 and S.D. is 1.3. Another benefit of acquiring technology is the increase in diversity of operations, where the mean is 4.0 and S.D. is 1.4.

## Table 4

Importance of technological objectives

| Characteristics | Total | | | Canada | | | India | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cases | Mean | S.D. | Cases | Mean | S.D. | Cases | Mean | S.D. |
| Increase in quality of product* | 25 | 3.3 | 1.7 | 13 | 2.5 | 1.7 | 12 | 4.1 | 1.3 |
| Increase in productivity of operation | 22 | 3.2 | 1.6 | 11 | 2.8 | 1.6 | 11 | 3.6 | 1.5 |
| Decrease in production cost | 23 | 3.2 | 1.7 | 12 | 2.9 | 1.6 | 11 | 3.5 | 1.8 |
| Increase in safety* | 22 | 2.5 | 1.7 | 11 | 1.5 | 0.9 | 11 | 3.6 | 1.6 |
| Decrease in pollution | 24 | 2.7 | 1.7 | 12 | 2.3 | 1.5 | 12 | 3.2 | 1.8 |
| Increase in diversity of operation | 24 | 3.8 | 1.4 | 12 | 3.5 | 1.4 | 12 | 4.0 | 1.4 |
| Increase in flexibility of operation | 23 | 3.1 | 1.3 | 12 | 2.9 | 1.2 | 11 | 3.6 | 1.4 |
| Increase in technological learning* | 25 | 3.7 | 1.6 | 13 | 2.9 | 1.9 | 12 | 4.5 | 0.7 |

*Significance differences at $\alpha < 0.05$.

The other objectives, i.e. `increase in productivity of operation', `decrease in production cost', `increase in safety', `increase in flexibility of operation' and `decrease in pollution' got equal and average importance (mean is around 3.5).

For Canadian enterprises, the most important technological objective is to `increase in diversity of operation' (mean = 3.5), whereas `increase in productivity of operation', `increase in flexibility', `decrease in production cost', and `increase in technological learning' are not that important (mean ≈ 2.9).

In case of technological objectives, the differences between the two groups for `increase in quality of product', `increase in technical learning' and `increase in safety' appeared to be statistically significant.

It is obvious from Table 4 that in the case of Canadian enterprises, suppliers of technology, these technical objectives are not as important as they are to the Indian firms. They are mainly motivated by the `market' objectives. `Market' objectives are divided into six groups (as shown in Table 5).

Table 5 shows the market objectives for total number of cases, their mean and S.D., as well as the cases separately for the respective countries. In the present study India was the recipient of technology. Out

of the 27 firms which we are dealing with, only 3 pairs of firms entered into technology transfer among themselves.

**Table 5**

Importance of market objectives

| Characteristics | Total | | | Canada | | | India | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cases | Mean | S.D. | Cases | Mean | S.D. | Cases | Mean | S.D. |
| Answer a request for technology | 19 | 3.5 | 1.4 | 7 | 3.0 | 1.6 | 12 | 3.8 | 1.3 |
| Serve present products | 20 | 2.7 | 1.4 | 12 | 2.7 | 1.6 | 8 | 2.6 | 1.2 |
| Serve present market* | 22 | 3.0 | 1.5 | 12 | 2.3 | 1.5 | 10 | 3.8 | 1.2 |
| Enter into a new market | 22 | 4.0 | 1.5 | 12 | 4.5 | 1.2 | 10 | 3.4 | 1.6 |
| Introduce new product* (same market) | 22 | 2.6 | 1.5 | 12 | 1.9 | 1.2 | 10 | 3.4 | 1.5 |
| Enter into new product/market (diversification) | 24 | 3.6 | 1.5 | 12 | 3.3 | 1.4 | 12 | 3.5 | 1.6 |

*Significance differences at $\alpha < 0.05$.

With the balance it has occurred among different firms. We were unable to get any response from their counterparts. This clarifies the situation, when 44.4% Indian cases expressed that their motivations deal mainly with

"the answer a request for technology", which implies they responded on behalf of their Canadian counterparts.

Table 5 shows the suppliers' major motive in entering into collaboration was to establish a new market. There are 12 cases among 13 Canadian firms with a mean of 4.5 which fall into this group. In the great majority of these cases, the firms involved in the collaboration had not previously exported to India. As a result, they were very much interested to enter into Indian market as a technology supplier.

The next important motive for Canadian firms is to enter into a new market and to enter with a new product (mean = 3.3).

Table 5 shows that 12 Indian firms among 14 firms felt that their counterparts reacted to the transferring process because they asked for it. Although 7 Canadian firms among 13 got involved for the same reason, that was not the only important reason, because the mean is 3.0. The mean appears to be 3.8 for Indian firms with same objectives.

Our study confirms the well known view that securing `direct' revenue from technology export is not the only objective of supplier firms. However, it is also true that the majority of the firms attached considerable importance to the objective of securing profitable direct returns for the technology through lump-sum payments and royalties.

As indicated earlier, collaboration took place in most cases as a result of development in the Indian market. Indian companies borrowed the technology from abroad mainly to serve their present market (mean = 3.8). They were facing some kind of problems in their own market. They did not waste their efforts and time, on first trying to develop themselves the technology in question. But, for Canadian firms `serving present market' is not an important motive to supply their technology. However, the mean of objective `introduce new product in the same market' is quite low, i.e. 1.9.

Furthermore, it is also evident from Table 5 that all other objectives could not be considered that important to all firms in both countries.

In case of market objectives, the differences between two groups for `serve present market' and `introduce new products in the same market' appeared to be statistically significant. This suggests that the firms are intent on exploiting their present markets, either with their present products or with new ones, in order to remain competitive. New technology appears to be a significant means in order to do that.

## III.5. TECHNOLOGICAL FORM AND CONTENT OF TRANSFER

### Introduction:

`Technology transfer' is the transmission of knowledge with or without the concurrent transfer of goods and services. One definition used by the World Intellectual Property organization in its Licensing Guide for Developing countries (WIPO Publication, 1977) states that `technology' means: "systematic knowledge for the manufacture of a product, the application of a process, or the rendering of a service, whether that knowledge be reflected in an invention, an industrial design, a utility model or a new plant variety, or in technical information or skills, or in the services and assistance provided by experts for the design, installation, operation or maintenance of an industrial plant, or for the management of an industrial or commercial enterprise or its activities".

This systematic knowledge or technical know-how encompasses the flow of various types of knowledge and skills. This knowledge may also cover a wide range of different types of knowledge, e.g. knowledge about products, process and methods, materials and components, applications and organization. In order to operate and maintain the new or changed production system that knowledge is required. It includes both information about specifications and procedures, and the skill as well as knowledge necessary to use this information for production. This information is

usually codified in manuals, and schedules. The knowledge which contains skills is usually provided through training and instructions.

## Survey results:

### Technical content of Indo-Canadian collaboration:

In this discussion we have considered the technological content of the collaboration. It may be considered `broad', if it involves a wide range of types of knowledge as discussed earlier. It may be considered `narrow' if it includes only some types of knowledge.

Table 6 shows that among 27 firms, 25 technology transfers contain not only knowledge of specific fields, but also includes drawing and their specification. There are only 18.5% cases where physical equipment was sent to the recipient firms. Once again, among these 18.5% transfers, 11.1% of them have transferred technical know-how and design along with the equipment.

**Table 6**

Nature of technology transfer

| Characteristics | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Technical know-how/design | 25 | 92.6 | 13 | 48.1 | 12 | 44.5 |
| Equipment | 5 | 18.5 | 3 | 11.1 | 2 | 7.4 |

Technical know-how or design was divided into a five sub-groups: `Product design know-how', `Plant design know-how', `Process design know-how', `Management know-how', and `Marketing know-how'. The purpose of these divisions is to know what kind of know-how was transferred mostly in a developing country, like India from a developed country, like Canada.

In this research we found that the most important medium of transfer was the technical know-how, as we described earlier. The technical know-how mostly includes product and process knowledge. Sometimes that knowledge includes the specific knowledge about equipment too. Table 7 shows that

**Table 7**

Relative importance of the nature of design know-how

| Characteristics | Total | | | Canada | | | India | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cases | Mean | S.D. | Cases | Mean | S.D. | Cases | Mean | S.D. |
| Plant design know-how | 23 | 3.4 | 1.6 | 12 | 3.2 | 1.9 | 11 | 3.6 | 1.4 |
| Process design know-how | 23 | 4.1 | 1.2 | 12 | 4.2 | 1.3 | 11 | 4.1 | 1.2 |
| Product design know-how | 25 | 4.6 | 1.0 | 13 | 4.3 | 1.3 | 12 | 4.9 | 0.3 |
| Management know-how | 24 | 2.3 | 1.5 | 12 | 2.4 | 1.5 | 12 | 2.1 | 1.5 |
| Marketing know-how | 23 | 2.5 | 1.3 | 12 | 2.8 | 1.4 | 11 | 2.2 | 1.3 |

`Product design know-how' is the most important transfer for all Canadian firms (mean = 4.3) and a mean of 4.9 and S.D. = 0.3 for 12 out of 14. Indian firms.

The next important knowledge transfer was process-design know-how. For 12 Canadian cases the mean was 4.2, and for 11 Indian cases the mean was 4.1.

Surprisingly, management and marketing know-how did not get much importance. It is possible that product-centered technology may be easier to import and assimilate than process-centered technology. This kind of technology requires time, and it is expensive and requires substantial restructuring which may be one of the main causes of the results given above.

## III.6. TECHNICAL MEANS OF TRANSFER

### Introduction:

The know-how agreement normally consists of selling information. Technical information can be described as engineering, manufacturing and information relating to the manufacture and servicing of a product. This information is generally transferred through blueprints of technical drawings, design sheets, sales of material specifications, photographs, Photostat and general data, as well as design and specification relating to manufacturing equipment, tools and fixtures (David Dichter et al., 1988).

The transfer of know-how can also be done by the transfer of physical machinery. Sometimes this part is overlooked or assumed to be of minor importance.

Technical assistance plays a major role in some cases of transfer of know-how. When this happens the agreement becomes a contract covering the transfer of this know-how from personnel to personnel over a period of time. It can include a period of intensive training for the personnel of the transferee country. Normally, this type of know-how agreement includes provisions for periodic visits by the employees of firms to the transferor's plant and for corresponding visit by transferor personnel to the transferee plant. The reason for the provision of periodic visits is to

observe each other's plants and production facilities. This interchange of information eventually leads to the optimal use of technology.

However, this type of technical assistance is very much necessary when the transferring process includes developed and developing or less developed countries. It can be tailored to fit the needs of LDCs or developing countries. Generally, these types of contract are of fixed duration and therefore they limit the cost to the transferee firms. Moreover, such an arrangement encourages the transferee enterprise to be self reliant and not dependent on foreign experts and technicians for longer than absolutely necessary.

## Survey results:

Table 8 shows the technical means of transfer that actually took place between Canadian and Indian firms.

**Table 8**

Relative importance of technological means of transfer

| Characteristics | Total | | | Canada | | | India | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cases | Mean | S.D. | Cases | Mean | S.D. | Cases | Mean | S.D. |
| Blueprints of technical drawings | 25 | 4.2 | 1.3 | 13 | 3.6 | 1.6 | 12 | 4.8 | 0.6 |
| Equipment | 24 | 3.0 | 1.6 | 12 | 3.3 | 1.6 | 12 | 2.7 | 1.7 |
| Technical assistance | 26 | 4.6 | 0.6 | 13 | 4.5 | 0.7 | 13 | 4.7 | 0.6 |

It shows that the most important and significant means of transfer was that of the technical assistance. All Canadian firms as well as 92.8% Indian firms pointed out that technical assistance was the most crucial in the process of technology transfer. The mean response of the importance of technical assistance and S.D. appeared to be 4.5 and 0.7, respectively for Canadian firms, and 4.7 and 0.6, respectively for Indian companies. The blueprint of technical drawing was also an important means of transfer, but it was more important in the case of Indian firms (mean = 4.8, S.D. = 0.6) than their Canadian counterparts.

Although technical assistance was a significant means of transfer for both countries, the time period and personnel involved was generally very limited. There were 48% cases where only 1 to 5 people were involved. However, there were only 7.4% cases where 20 to 25 people were involved for a project. The time period mostly varied from 1 week to 6 months. There were 11.1% cases where it was 2 years, and another 11.1% cases where it was a continuous process not bound by a time limit.

As most technical assistance agreements are for a limited period only, the transferee may risk receiving only a partial transfer of knowledge. This could be a major problem for the transferee firm. But, in our research, it appeared that in most cases where there were licensing agreements or a joint ventures, they provided additional assistance on an `as-needed' basis.

This research also dealt with the type of services offered by the Canadian firms before, after and during their transfer agreement. Sometimes it is not really enough just to send the equipment or blueprints of technical drawings. It must be followed by proper guidance and assistance. So, it is relevant to know what types of services were offered. The services rendered during the global transaction were divided into three phases shown in Table 9: before sales, during sales and after sales services, under three categories, `Technical', `Marketing', and `Financial'.

Table 9 shows that the technical services were the most important services offered or received by the firms in three phases of their transaction. The mean response of the services is approximately same for both countries. The Indian firms received more technical service before and during sales (mean = 4.6, and 4.5, respectively) compared to after sales technical services (mean = 4.1). On the other hand, the Canadian firms offered technical services more or less in the same manner in these three phases of transaction.

The Indian firms received more services in terms of marketing in their after sales transaction, where the mean = 3.0. In terms of other services, it was not that important to the firms in both countries, because the mean appears to be around 2.5 or less. However, the differences between two groups are not statistically significant, which indicates that the perception of the suppliers and the receivers is relatively the same.

## Table 9

Relative importance of nature of services before, during, and after sale

| Characteris-tics | Total | | | Canada | | | India | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cases | Mean | S.D. | Cases | Mean | S.D. | Cases | Mean | S.D. |
| **Before Sales:** | | | | | | | | | |
| Technical | 24 | 4.4 | 0.9 | 12 | 4.3 | 1.1 | 12 | 4.6 | 0.7 |
| Marketing | 19 | 2.7 | 1.5 | 12 | 2.9 | 1.4 | 7 | 2.4 | 1.5 |
| Financial | 20 | 1.8 | 1.2 | 12 | 1.7 | 0.8 | 8 | 1.9 | 1.6 |
| **During Sales:** | | | | | | | | | |
| Technical | 25 | 4.4 | 1.1 | 12 | 4.3 | 1.0 | 13 | 4.5 | 1.2 |
| Marketing | 21 | 2.4 | 1.5 | 11 | 2.5 | 1.4 | 10 | 2.3 | 1.8 |
| Financial | 20 | 1.7 | 1.2 | 10 | 1.7 | 0.8 | 10 | 1.7 | 1.5 |
| **After Sales:** | | | | | | | | | |
| Technical | 24 | 4.2 | 1.2 | 12 | 4.3 | 1.0 | 12 | 4.1 | 1.4 |
| Marketing | 20 | 2.7 | 1.6 | 11 | 2.5 | 1.4 | 9 | 3.0 | 1.8 |
| Financial | 18 | 1.5 | 0.9 | 10 | 1.6 | 0.8 | 8 | 1.4 | 1.1 |

## III.7. NEGOTIATION

### Introduction:

The period of negotiations is the most important phase of the total operation. Negotiation is the phase where a planning team consisting of representatives of both countries may reach a synthesis through structural debate (Madu and Jacob, 1989). Negotiations are frequently an important part of this process when various different organizations or agencies are involved in developing the goals and objectives as well as the methods and budget for the proposed technology transfer activity (O'Keffe and Marx, 1982).

Particularly, in international communications where information must be transmitted about different political, economical and social structures through different cultures and often through different languages, the problems involved in transmitting accurate information are enormous. The transferor may require some assurance in terms of political stability, public policies (i.e. taxes, foreign exchange relations import/export restrictions), etc. On the other hand, transferee will be concerned about the training of their nationals, the availability of getting limited patents for producing the technology, the limitations on exports, the cost of purchasing the technology, the possibilities of developing appropriate research, etc.

Frequently, these negotiations play a critical role in deciding whether a technology transfer project is ever implemented. The success of the negotiation phase signifies that all conflicts or opposing viewpoint have been resolved. In cases where, conflicts are not resolved within a time frame, a deadlock is reached and the parties might seek alternative partners. Hence it is important to have a time frame to guide the entire process of negotiation.

The process of negotiation aids in establishing a communication pattern between two countries. Through effective communication, the goals, objectives and aspirations of both parties become clarified. Thus, effective communication is invaluable for the effective transfer of technology (Madu and Jacob, 1989).

**Survey results:**

In our research we inquired about the types of problem the entrepreneurs faced in the process of negotiation, and also about the time frame they needed from the initial contact stage to the signing of the agreement, i.e. for the whole negotiation process.

The negotiation process varied from 6 months to more than two years. Table 10 shows it was a long procedure. For 51.8% cases, it took either 1 to 2 years or more than two years. Among these 18.5% cases in Canada took more than 2 years to finish their negotiation procedure. In 29.7% cases, it

took 6 months to 1 year. Only in 18.5% cases, it was very rapid, i.e. it took only from 0 to 6 months.

**Table 10**

Duration of negotiation

| Duration | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| 0 - 6 months | 5 | 18.5 | 2 | 7.4 (15.4) | 3 | 11.1 (21.4) |
| 6 months - 1 year | 8 | 29.7 | 4 | 14.8 (30.7) | 4 | 14.8 (28.6) |
| 1 - 2 years | 7 | 25.9 | 2 | 7.4 (15.4) | 5 | 18.5 (35.7) |
| > 2 years | 7 | 25.9 | 5 | 18.5 (38.5) | 2 | 7.4 (14.3) |

Note: The percentage in parentheses represents the percentage share relating to particular country.

Table 11 shows the elements of main difficulties which were encountered during the process of negotiation. The major problem that the Canadian firms faced was the involvement of the Indian Government in the negotiation process. The mean response of this problem appears to be 3.9. However, the Indian firms did not face that problem so strongly, because the mean response was 2.7.

## Table 11

Difficulties of negotiation

| Characteristics | Total | | | Canada | | | India | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cases | Mean | S.D. | Cases | Mean | S.D. | Cases | Mean | S.D. |
| Financial package | 22 | 2.9 | 1.6 | 11 | 2.5 | 1.4 | 11 | 3.2 | 1.8 |
| Government involvement | 24 | 3.3 | 1.7 | 12 | 3.9 | 1.5 | 12 | 2.7 | 1.8 |
| Cultural gap* | 21 | 1.9 | 1.4 | 11 | 2.5 | 1.6 | 10 | 1.3 | 1.0 |
| Legal difficulties | 24 | 2.1 | 1.3 | 11 | 2.7 | 1.1 | 13 | 1.6 | 1.2 |
| Right of improvements | 23 | 1.6 | 1.0 | 11 | 1.7 | 1.0 | 12 | 1.5 | 1.0 |
| Market uncertainties | 21 | 2.3 | 1.8 | 11 | 2.0 | 1.1 | 10 | 2.6 | 2.4 |
| Technical requirement | 24 | 2.1 | 1.6 | 11 | 2.2 | 1.5 | 13 | 2.0 | 1.7 |

* Significant differences at $\alpha < 0.5$.

The next major difficulty for Canadian firms was that in the legal field (mean = 2.7) compared to the Indian firms (mean = 1.6).

Although the basic level of language was not a problem, the cultural gap created some problem among Canadian entrepreneurs, where mean = 2.5. But, Indian firms did not feel that way. The mean response appears to be only 1.3. The reason being that the Indians are more exposed to western

culture than the Canadians to Indian culture. The differences between two groups appear to be statistically significant.

Negotiation over financial package was a problem for the Indian firms, mean = 3.2. For the Canadian firms, it was not that troublesome. This situation can be explained by the fact that the Indian firms were on the paying end and the Canadians were on the receiving hand. The power of negotiation was probably more favorable to the Canadians. However, all other difficulties appear to be negligible to all firms.

Thus, it can be stated that the Indian Government policies are responsible for causing difficulties in negotiations, and also cause delays in getting through the Government approval procedures.

## III.8. LEGAL ASPECTS OF TECHNOLOGY TRANSFER

The basic legal aspects of technology transfer agreements includes a number of principal issues of legal procedures between two countries. The basic legal issues of concern to the technology suppliers and recipients are:

i) Modes of technology transfer selected;
ii) Nature of non-statutory rights;
iii) Duration of agreement;
iv) Legal limitations relating to use of technology;
v) The rights and obligations relating to improvements in technology;
vi) Legal difficulties faced by the entrepreneurs during the transferring process.

The following chapters will illustrate these basic legal aspects of technology transfer agreements.

## III.8.1. MODES OF TECHNOLOGY TRANSFER

### Introduction:

The technology may consist of `product' and the basic purpose of the transaction may simply be to permit the recipient to reproduce and distribute the product as it exists. On the other hand, the technology may consist of the results of a research and development program and the commercial applications of such results may not be well defined (Szibbo, 1984).

However, the subject matter of technology transfer agreement usually relates to statutory and non-statutory rights. The former are patents, trademarks, industrial designs and copyrights, the latter may constitute trade secrets, confidential information, know-how and show-how (i.e. training and technical assistance).

A license is commonly used where the owner of certain statutory rights in the technology (i.e. patent, trademark, industrial design or copyright) grants permission to another party to exercise some of those exclusive rights held by the owner of the technology; or where the supplier grants the rights to utilize technological information which is not protected by statute, but which through the expenditure of skill, effort of knowledge, has been put together into a know-how or show-how form and is protected on a trade secret basis. In some situations, a license may grant

rights to technology of which the licenser is not the owner but which the licenser has acquired by license from a third party and is permitted to sub-license (Government of Canada, 1986).

## Survey results:

Based on our research we classified the agreements according to the following forms of technology transferred: i)license, ii) patents, iii) trademark, iv) equipment, v) drawings and specifications, and vi) others (services).

Table 12 shows the numbers of agreements entered into each category. It shows several interesting features.

**Table 12**

Relative frequencies of basic format of transfer

| Characteris-tics | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| License | 14 | 51.8 | 7 | 25.9 | 7 | 25.9 |
| Patent | 6 | 22.2 | 3 | 11.1 | 3 | 11.1 |
| Trade-mark | 6 | 22.2 | 4 | 14.8 | 2 | 7.4 |
| Equipment | 5 | 18.5 | 3 | 11.1 | 2 | 7.4 |
| Drawing and specification | 6 | 22.2 | 2 | 7.4 | 4 | 14.8 |
| Service | 2 | 7.4 | 2 | 7.4 | - | - |

For one, unpatented knowledge seems to have been more extensive transferred than patented know-how. There are only 6, i.e. 22.2%, belonging to patented knowledge out of 27 technology transfers. Secondly, licenses appear to be the most important forms by which technology has been transferred. Agreements relating to licenses accounted for 51.8% of the total number of agreements. Those relating to drawings and specifications accounted for 22.2%, and those relating to services formed 7.4% of the total agreement.

Licenses, however, differ from other types of agreements with respect to the contractual obligations of the licenser. Granting a license to a particular firm to produce a particular item usually implies that a license will not be granted by the licenser to a rival firm for a similar product. Thus, license was generally used more frequently than other modes of transfer.

## III.8.2. NON-STATUTORY RIGHTS

### Introduction:

In almost every transaction, technology cannot be transferred to be viably exploited and commercialized by relying merely on these traditional statutory rights (i.e. patent, trade mark, industrial design and copy right). Various elements, such as `show-how' and `know-how' are now recognized as crucially important to the success of technology transfer. Therefore, the technology transfer agreement often includes provisions dealing with non-statutory rights.

A trade secret can be defined as consisting of any secret formula, pattern, device or compilation of information used in one's business which can obtain an advantage over competitors who do not know about it or use it. It may be a formula, manufacturing process or design for a machine, information relating to the marketing and sales of goods or office management or business processes involving customer lists or methods of bookkeeping. In many agreements, there are references to `know-how' and `show-how' being supplied. There are no recognized by-laws as separate legal categories, but have become a convenient way of describing certain areas of technology (Government of Canada, 1984).

`Know-how' is any knowledge and experience which relates to technology. `Show-how' can be defined as training and technical assistance,

instruction, supervision consulting and related ongoing support services to assist the recipient in using efficiently and profitably either the common knowledge `know-how', trade-secret `know-how', or the patent and other statutory rights (Government of Canada, 1984).

## Survey results:

Table 13 shows the importance of non-statutory rights (i.e. trade secret, confidential information and know-how/`show-how') in recent technology transfer agreements. As we can see from this table, know-how or show-how became an important means of transfer, e.g. 66% of total agreements include this category in their agreement. For 55.5% cases, agreement related to confidential information, and for 29.6% cases, trade secret was the part of the agreement.

**Table 13**

Non-statutory rights

| Characteris-tics | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Trade secret | 8 | 29.6 | 7 | 25.9 | 1 | 3.7 |
| Confidential information | 5 | 55.5 | 8 | 29.6 | 7 | 25.9 |
| Know-how/show-how | 18 | 66.6 | 8 | 29.6 | 10 | 37.0 |

The research found earlier that the process design know-how is the second most important means of transferred knowledge (discussed in technical content of collaboration) in the knowledge transfer project. This type emphasizes the `assistance' relationship between the transferee firms and transferor firms. As a result, the confidential information and know-how/show-how became quite important means of transferring the knowledge in our sample.

## III.8.3. DURATION OF AGREEMENT

### Introduction:

The duration of the agreement under the applicable legislation is an important factor to the parties in determining the terms of the license. However, an equally important factor is the relevance of the statutory protection which the technology enjoys.

### Survey results:

Table 14 shows the duration of the Indian and Canadian technology transfer agreement. Duration mostly varies from 2 years to 10 years.

**Table 14**

Duration of agreement

| Duration | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| 2 - 5 years | 8 | 36.4 | 4 | 18.2 | 4 | 18.2 |
| 5 - 10 years | 8 | 36.4 | 3 | 13.6 | 5 | 22.8 |
| 10 years and more | 2 | 9.1 | 2 | 9.1 | - | - |
| Continuous | 4 | 18.2 | 4 | 18.2 | - | - |
| missing | 5 | missing | - | - | 5 | - |

There are 36.4% cases where the agreement was 2 to 5 years and 5-10 years. Only for 9.1% cases, it was more than 10 years. For 18.2% cases, it was on a continuous basis, because these cases the technology was supplied to their subsidiary or they were involved in a joint venture.

The survey results suggest that the Canadian suppliers were reluctant to involve in long-term agreements with their Indian counterparts. 73% of agreements were short-term contracts, and the duration of those agreements varied from 2 years to 10 years.

## III.8.4. LEGAL RESTRICTIONS

### Introduction:

Technology licensees must invariably agree to some limitations on its use. One such limitations is the scope of use of the technology. The scope may be limited to specific applications, use, manner of use, re-transferring the technology, reproductions, etc. Suppliers usually provide a geographical limitations on the recipient's right to exercise the use of technology in order to protect their own competitive position. The intensity of this type of limitation depends mainly on the objectives of the foreign enterprises when they enter into technical collaboration agreements. If the financial returns occurring from the sale of technology are their only objective, they might not put too much restriction on the recipient.

But, when the foreign firm's objectives include market protection, their need to retain control over territory might be important. The most explicit restriction that foreign firms stipulate under the agreement is relative to the exports of the recipient. The restrictions on exports are designed to protect the sales of the transferor's firm in a third market against potential competition from the transferee firm. Foreign firms might stipulate a total ban on exports from the recipient firm to certain areas, or the recipient firm might obtain the permission to export to certain areas. The desire for control might also depend on the nature of the

business. It would be higher in relatively technologically intensive field of activity, and in cases where foreign firm's degree of monopoly is high. In some cases, the restrictions depend on the degree of complexity and sophistication of the technology.

**Survey results:**

In our study, we also found that the territorial restriction was most frequently used by the Canadian firms. Table 15 shows that in 29.6% cases, it was imposed on the Indian firms. There were only 7.4% cases where resale was prohibited by the transferor firms. This restrictions normally apply to the recipient's ability to transfer its acquired technology to third parties, whether through assignment or sub-licensing.

**Table 15**

Relative frequencies of different types of legal restrictions

| Characteris-tics | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Territorial restrictions | 8 | 29.6 | 4 | 14.8 | 4 | 14.8 |
| Disclosure | 3 | 11.1 | 1 | 3.7 | 2 | 7.4 |
| Resale | 2 | 7.4 | 1 | 3.7 | 1 | 3.7 |
| None | 7 | 25.9 | 4 | 14.8 | 3 | 11.1 |
| missing | 7 | missing | 3 | - | 4 | - |

11.1% of the cases, the limitation was not to disclose confidential information and know-how, and 25.9% of the cases, the response was missing. However, in 25.9% cases, no restriction was imposed.

Our survey result suggests that in 75% of transfers some kinds of restrictions were imposed. However, the territorial restriction was the main form of restrictions imposed by the suppliers. This suggests that the technology transfers were limited to the Indian territory. There were only 7.4% cases where export to the Asian countries were allowed.

## III.8.6. RIGHTS GRANTED

**Introduction:**

Technology, being a form of knowledge, will likely be enhanced with accumulated knowledge acquired by the transferor as well as the recipient. The very purpose of some technology transfer agreements is to enable the recipient to improve the technology. Therefore, the respective rights of the transferor and the recipient should be specified. The recipient should obtain the right (where appropriate) to modify, enhance and improve the technology. The transferor must acquire the right to receive notice from the recipient of improvements and developments to the technology.

In our research, those rights are classified as `improvement', `development', `innovation' and `invention' rights.

Improvement: Technology requires continuous changes and improvements to meet industry's needs. Achieving the highest level of quality requires a well-executed approach to improvement. It must be an integral part of operations. `Improvement' implies any minor modification of technology.

Development: `Development' refers to a major changes in the technical process. Development knowledge is generally oriented towards the creation of a new design, process or product. It allows an active diffusion

of the technical information on design and know-how. It is generally achieved by technical experience and technical know-how.

Innovation: If technology in its fundamental dimension, is seen as a form of knowledge, technical innovation can therefore, in its fundamental aspects, be analyzed as a learning process. Technical innovation leads to a better equilibrium between the continuity and discontinuity factors involved in that process, where entails some technical renewal with its discontinuities, but where the same innovation can also be seen as a creative extension of the present organizational realities, resources and constraints (Carrière, 1992).

Invention: Patent descriptions provide sufficient information to enable the invention to be duplicated. They are therefore, source of technology which are freely available in that qualified persons may acquire the know-how, although not necessarily the right to reproduce the invention (Stead, 1987).

## Survey results:

We inquired about the kind of rights that were granted in the technology transfer agreements. Table 16 shows the different kinds of rights which were granted to the Indian firms by the Canadian firms. Most of the firms got the improvement rights of the technology (i.e. 33.3% of total agreements). 29.6% got the development rights, 14.8% got the innovation rights, and 11.1% got the invention right of the technology.

## Table 16

Relative frequencies of different types of rights granted

| Characteristics (Rights) | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Improvement | 9 | 33.3 | 4 | 14.8 | 5 | 18.5 |
| Development | 8 | 29.6 | 6 | 22.2 | 2 | 7.4 |
| Invention | 3 | 11.1 | 1 | 3.7 | 2 | 7.4 |
| Innovation | 4 | 14.8 | 2 | 7.4 | 2 | 7.4 |

The acquisition of various types of rights could contribute significantly to the development of capabilities in technology importing firms. Indian partners frequently mentioned the importance of acquiring different types of rights carrying out improvement activities. Otherwise, it could be a significant obstacle to the effective application of the technology.

## III.8.6. LEGAL DIFFICULTIES

### Introduction:

Policies and procedures of the host government towards foreign capital and technology can influence the general pattern of the foreign enterprise participation. Not only they can influence, but they can also significantly affect its success. These facts are reflected in the Indian Government's official policy towards foreign collaboration. Although most of the firms did not face any major legal constraint for their collaboration, few firms reported that getting Government of India's approval really delayed the transfer process.

### Survey results:

As Table 17 shows there were 18.5% cases where they were facing problem with the bureaucracy of the Indian Government. Among them 14.8% are Canadian, and only 3.7% are Indian. Thus, Canadian entrepreneurs faced more problems with the Indian Government than the Indian entrepreneurs. The major problem was the banking restrictions for transfer of funds by the Government of India. The Government of India has to grant an approval to the banks for the transfer of funds in foreign currencies. One frustrated Canadian entrepreneur stated: "Once in India we were told that we could not be paid up front for work since Indian Government wouldn't allow payment in hard currency until after a contract was awarded. We would not have visited

India if we had not thought that we would not be allowed to bill for our services in that country in a normal way." This quotation captures the crux of the problem.

Apart from the fact that the Government of India's approval is needed in all foreign money transactions, one Canadian firm found that there was also a conflict between Indian vs. Canadian Law. But, of course, the details of the conflict were not elaborated in our survey. For another Canadian firm

**Table 17**

Main legal difficulties

| Characteristics | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| None | 13 | 48.1 | 3 | 11.1 | 10 | 37.0 |
| Indian Government's approval | 5 | 18.5 | 4 | 14.8 | 1 | 3.7 |
| Others | 3 | 11.1 | 3 | 11.1 | - | - |
| missing | 6 | - | 3 | - | 3 | - |

it was the problem of collecting the final balance, which though not mentioned under the category of Government approval, was not clarified, but it seemed that the nature of the problem was related to the above-mentioned financial problem. Only one Canadian firm faced the problem of setting the

scope of the geographic market. We have categorized these three problems as `others' in Table 17. In spite of all these different problems, 48.1% cases proceeded smoothly without any legal difficulties. But, it is noticeable that only 11.1% Canadian companies fell in this category compared to 37% Indian companies.

It is quite obvious that Canadian firms felt more legal constraint than their Indian counterparts as they were entering into a new and foreign market in a developing country.

## III.9. TECHNOLOGY TRANSFER PAYMENT

### Introduction:

Technology transfer payment scheme can be simple or very complex. In some cases technology rights are transferred, but payment is on a non-monetary basis, e.g. the granting of equity interests in the recipient's business through share transfers in exchange for the technology, or the provision of services or products in return for the technology rights.

Monetary compensations generally fall into the categories of non-royalty and royalty compensation. The simplest form of non-royalty compensation consists of a fixed price payment, paid either `up-front' or in installments. Other examples of non-royalty compensation are cost and cost-plus fees, and compensation per unit of technological assistance (Government of Canada, 1986).

### Survey results:

In our study we found that most of the payments were related to non-royalty compensation as stated above. Table 18 shows that 62.9% cases fall into this category. They are divided into three groups of installment payments, lumpsum payments, and others.

**Installments:**

In case of installment payment, it involves three installments and 33.3% cases fall into this category. Although for most cases payment was done in three installments, the terms of payment were different for different transfers.

**Table 18**

Relative frequencies of different terms of payment

| Characteris-tics | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Installment | 9 | 33.3 | 3 | 11.1 | 6 | 22.2 |
| Lumpsum only | 4 | 14.8 | 3 | 11.1 | 1 | 3.7 |
| Royalty only | 3 | 11.1 | 1 | 3.7 | 2 | 7.4 |
| Royalty & lumpsum | 3 | 11.1 | 2 | 7.4 | 1 | 3.7 |
| Lumpsum & installment | 1 | 3.7 | - | - | 1 | 3.7 |
| Equity share | 2 | 7.4 | - | - | 2 | 7.4 |
| Others (cost plus basis) | 2 | 7.4 | 1 | 3.7 | 1 | 3.7 |

Here we describe in detail how the payments were made in different cases. In one case, the first payment had to be paid on the approval of the collaboration; second on the delivery of the know-how; and third one was to be done when the production began. In another case, it was 30% down

payment, 60% upon shipment of equipment and 10% upon successful installation. In the next case 30% down payment was made, 30% on receipt of the first sample and the rest was to be done when first production started. In one case part payment was within 12 months of the signing the agreement and the balance was to be made when production started, i.e. within 48 months. However, in one case, no precise terms were fixed, but the first installment had to start after 5 years and repayment had to be done in some parts in 10 years and some parts in 15 years. For all of the above cases and also the other three installment cases, the duration of the agreement varied from 5 years to 10 years.

There is a special case where installment consists of 12 installments. In this case the first installment was to be made within 2 months, the second one was after 6 months and the balance was to be done in 10 installments, every 6 months.

**Lumpsums:**

In 14.8% cases, payments were made on a lumpsum basis, and they were charged mostly where the duration of the agreement was `not fixed' or it was an `on-going' agreement. Fixed payments rather than a royalty tied to sales or productions is generally preferred by the foreign firm when it has not conferred exclusive rights of production and sales to the Indian firm - possibly because it is too small to capture the market.

**Royalties:**

Only in 11.1% cases, royalty was charged as the only mode of payment. Among them, in two cases it was charged on quarterly production, and in one case, it was based on the sales. Royalties are tied to sales or productions in agreements of longer duration, because it is felt that the prospects of the recipient firm expanding its sales over a longer period are better.

**Royalties and lumpsums:**

There are 11.1% cases where the payment was done in lumpsum, and then later in royalties. In one case, a lumpsum payment was made for the design and know-how, and 5% royalty was paid on the sales. One Canadian firm charged disclosure fee as well as royalty. For another Canadian firm it was the initial fee and then the royalty that was paid. The same features were found in the case of royalty and lumpsum payment as in only lumpsum payment. Those agreements were either `not fixed' in nature or were extendable after a few years. Of course, there were cases where the above-mentioned mode of payment was used in the fixed duration agreement.

**Equity shares:**

There were two cases where technology was transferred for equity shares. In one case it was for 8 years and in another case Canadian firm sent equipment for equity partnership.

There were two cases, which fell into `others' categories. Their payment mode was on a cost-plus fees basis.

In the process of the research, we also found out that among 27 transfers, 55.5% cases were totally done by 100% internal financing. In 7.4% cases Government of Canada came into the picture. They divided the financial package into 50:50. The Government of India also helped in 7.4% (2) cases. In one case, the financing was done totally, i.e. 100%, by the Indian Government. In second case, there was some financial contribution by the Government of India. It appeared that one transferred process was 100% financed by the World Bank.

# III.10. TECHNOLOGY ADAPTATION

## Introduction:

Apart from the foreign firm's willingness to transmit knowledge, the transferee firm's ability to absorb and utilize it is also an important determinant of the extent of knowledge transmitted. The ability to adjust the technology to suit the smaller scale of local production and to local market needs may be crucial in this context. For a long time, the economists were very much concerned about the suitability of techniques perfected in the industrially advanced economies of the West to the conditions prevailing in developing countries. Imported technology needs to be restricted to suit indigenous labour needs, the climate, and the culture. Adaptation and utilization of imported technology may call for two types of adjustment. The imported designs and equipment may have to be restructured to fit local needs and conditions, and the indigenous resources may have to be adapted to the imported know-how (Balasubramanyam, 1973).

## Survey results:

In our investigation, we noticed that Indian industries needed more or less adaptation of acquired technology. Only 7% industries out of 14 said that they did not need any adaptation. They could use it as it was given. 21.4% of the cases they had to make alterations in the imported

designs to suit local conditions. The alterations were made by themselves. In most of the cases, the existing R and D strength was often able to absorb the new technology and to modify it. In 7% cases, they had to change certain raw materials in view of the environmental conditions in India. Thus, it was obvious that foreign firms did not have to make any efforts to restructure the technology to suit local needs. However, it was also true that Indian firms did not alter the basic designs of the foreign firms. Based on information gathered from Canadian firms little effort was made by them to restructure technology to suit Indian needs. As our research shows in 38.4% cases, they had to change it a little, whereas in 46.1% cases, they did not change it at all. In 23% cases, they stated that they made some changes.

It appeared in our research that all the instances where restructuring of the technology took place before it was transferred to their counterparts were joint ventures. Whereas, in the case of licensing agreement the foreign firms did not go to the expense of restructuring the technology to suit the needs of the buying firm.

## III.11. THE ROLE OF TRAINING

### Introduction:

Training as a method of technology transfer is considered to be an essential means through which, if it is properly managed, know-how and know-why are transferred successfully to local personnel. Education, including training and practical experience, is one of the most effective means of transferring technology. As a result, it is extremely important to pay adequate attention to training. This can be achieved by ensuring that training requirements are clearly stated in an agreement. An agreement should make it categorically clear whether personnel will be trained on the job or in the transferor's overseas plant.

Multinational companies operate training programs for the host country's nationals on a scale which is equivalent to adding a large technical high school in the country. They train nationals as operators, functional executives and eventually as top managers. Such investments can allow the country to eliminate the decades of time required to educate people, develop processes, and generate investment sources internally (Quin, 1969). Thus, training of workers transfer huge amounts of technology. Training of users is the most essential elements in transferring certain technology.

There are few ways through which individuals can receive education, training and practical experience (Al-Ali, 1991). Among them are:

a) Formal in-house training program,

b) Training program overseas,

c) In-plant course,

d) On-the-job training,

e) Literature (books, journals, etc.).

**Survey results:**

In this study, an attempt was made in the questionnaire to study the content of training. The content of training was divided in five groups: technical training, design know-how, product manufacturing, process know-how and others, as shown in Table 19. Table 19 reveals that in 59.2% cases, the main training program pertained to the technical aspects of the technology. In 37% cases, it was product manufacturing, 22.2% cases were involved with training in process know-how, and 18.5% were involved in design know-how. There were 33.3% cases which fell into the `other' category. In that category, according to reposes, training did exist in one case, but it was not documented. In another case, training was just done through the transfer of a descriptive manual. However, in other 25.9% cases, there was no training program at all.

In the cases of training that involved design or process know-how, seminars, workshops, lectures, and on-job-training were the basic means of transfer. In some transfers, field training constituted a major part of training. However, in a few cases, the `know-how' provided was very

detailed, and training covered different elements of knowledge. On the other hand, in other cases, the `know-how' provided was narrow, and it included some elements of knowledge which the supplier used to support its production. In some cases training was of very short duration and range, often involving a visit for a few weeks by an Indian person to the supplier's plant.

**Table 19**

Relative frequencies of different forms of training

| Characteris-tics | Total | | Canada | | India | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Technical | 16 | 59.2 | 8 | 14.8 | 3 | 11.1 |
| Design know-how | 5 | 18.5 | 2 | 7.4 | 3 | 11.1 |
| Manufacturing | 10 | 37.0 | 5 | 18.5 | 5 | 18.5 |
| Process know-how | 6 | 22.2 | 2 | 7.4 | 4 | 14.8 |
| Others | 9 | 33.3 | 4 | 14.8 | 5 | 18.5 |

Survey showed that, except in two cases, there were very few people who actually received training related to the technology transfer. In most cases, the number varies from 1 person to 10 persons. In those two exceptional cases, 41 to 60 persons received training from abroad. The duration of training was also very limited in most cases. 37% of the cases, it lasted from 2 weeks to a maximum of 10 weeks. In one case, it was just

one day, while in another case it took 5 years. It was a continuous process for another. But, for the remaining cases it was continued up to approximately 6 months.

The nature of training showed that in almost every case more than 80% of training was done at the Canadian firms. Only in the case of three joint-venture projects training was mostly (90%-100%) done at the recipient firms.

In general, in cases investigated, training was not an extensive part undertaken by the transferee firm. The data suggests that the recipients' personnel did not depend entirely on foreign firms for the execution of the projects. This indicates that the Indian personnel was somewhat familiar with the imported technology before buying it. The Indian firms have also asserted that they did not experience difficulties in terms of understanding the technology.

## III.12. PERFORMANCE

We have discussed so far the nature of the technology and its adaptation to the recipient firms. In this point, it is relevant to evaluate the technology transfer project.

The technology transfer project evaluation is a complex process. In this research, we tried to evaluate it in two ways. First, we emphasized on different types of learning, i.e. what kind of technological knowledge the firms actually acquired from the `technology transfer' program. Those answers gave an overview of the nature of the outcome related to the project. Second, the research inquired into more direct questions about the actual achievements in technical, market and financial objectives in the technology transfer process.

The total learning process was divided into five groups. They were: `know-how' learning, new design learning, new process learning, new product learning, and new service learning. As Table 20 shows, the Indian firms learned a lot about the `know-how' of that very technology (mean response = 4.3). It appears that they also learned about the new design, new process, and new product.

Table 20 reveals that among Indian firms, 64.2% firms learned about new designs with a mean = 4.1, 85.7% firms learned about new processes with

a mean = 3.8, and 71.4% firms learned about new products with mean = 3.7. Once again, it seems that they learned little about new services. The difference between two groups for all these learnings, except for service learning, appears to be statistically significant.

For one Indian company, the learning is kind of unique in nature. In their own terminology, they called it `project management' learning. They expressed it: "By and large, in our company many projects have cost and time overheads. So, in this case by associating ourselves with an advanced country we learned the importance of the projects be ready on time and within budget".

**Table 20**

Relative importance of different forms of organizational learning

| Characteristics (learning) | Total | | | Canada | | | India | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cases | Mean | S.D. | Cases | Mean | S.D. | Cases | Mean | S.D. |
| Know-how* | 20 | 3.3 | 1.7 | 10 | 2.2 | 1.0 | 10 | 4.3 | 1.5 |
| New design* | 20 | 2.5 | 1.8 | 11 | 1.2 | 0.8 | 9 | 4.1 | 1.3 |
| Process* | 23 | 2.7 | 1.8 | 11 | 1.6 | 1.3 | 12 | 3.8 | 1.6 |
| New product* | 21 | 2.5 | 1.8 | 11 | 1.4 | 1.0 | 10 | 3.7 | 1.6 |
| New service | 21 | 2.3 | 1.6 | 11 | 2.4 | 1.7 | 10 | 2.2 | 1.4 |

*Significant differences at $\alpha < 0.5$.

As a supplier of the technology, the Canadian enterprises obviously did not learn much concerning the above-mentioned learning dimensions. The data in Table 20 indicates that some firms actually learned something about `know-how' learning and new service learning compared to those of the other types of learning in the process of their technology transfer. According to two Canadian entrepreneurs they acquired some knowledge about the markets in India. Such a more in depth understanding of market and business practice will help them to deal more effectively with technology transfers in the future. One entrepreneur pointed out that he learned a lot about different cultures and different uses for the products in other countries.

To evaluate the intensity of organizational learning we asked two questions: first was whether the recipient firms could transfer this know-how to another firm, and the second was if they were capable of designing new and improved products for their local markets as a result of these technology transfers.

On the Indian side, the answer to the above question was negative only in the case of two firms. One firm's response was that the technology had been partially absorbed because it was not able to do the effective transfer. In all other cases, they were able to do it. But in four cases, they were limited by the confidentiality clause in their agreements. Among them, one manager said: "We have the capacity to do, but we should not and would not because of the clause restrictions".

For the second question, all firms, except one, answered positively. They were able to design and improve their products for the local market following the technology transfer.

On the Canadian side, the responses to those questions were similar.

Thus, most of the Indian firms felt that they actually learned a lot from the technology transfer, and that some of them were actually able to transfer the technology to another local firm, and that they were even able to design a new and improved product.

As we come to the performance which involves a more direct approach of performance, the result shows that on the Indian part, 35.7% (5) of them were very much satisfied with their performance. The questionnaire defined three objectives separately, i.e. expected technological objectives, expected market objectives, and expected financial objectives. Those three objectives were very much fulfilled for 35.7% of the cases. It was achieved because the technology transfer was made in time and there was good understanding and openness between the two organizations. As a result the firms obtained substantial increase in business.

7.1% (1) of the cases, it was a failure, i.e. none of the objectives were achieved because of the financial inadequacy on the part of the Indian firm. In another case, achievement was very little because of a recession in the industry. As a result, they were not even able to recover the investment at that time. In the rest of the cases, the projects were under

execution at the time, or in some cases, manufacturing was yet to start. Thus, they were not able to tell the performance of these technology transfer objectives.

On the Canadian part, 53.8% (7) projects were successful. Among them, three cases were totally successful. The suppliers considered that objectives of their collaboration had been achieved, i.e. as a result of their collaboration the Indian partners acquired the capacity to manufacture a new and improved product, and they were operating in a profitable manner at that time. In the remaining four cases, they considered that their objectives were partially achieved. They achieved technological and market objectives to some extent, but the financial gains were not there. They provided a foreign company with technical knowledge that improved their operation. And, for market objectives, they introduced their existing product to a new market where they have excellent annual market share growth rate. Although the new markets were developed, the Indian Government charged a larger share on the income earned by the enterprises and on dividends and royalties which actually diminished their financial gains. Thus, the financial gains were average.

15.3% (2) of the cases, although knowledge was transferred in a satisfying manner, the market and financial objectives were not met at all. In one case, "the recipient had no interest in selling the product in the home market. They wanted to export it in order to earn hard currency" - as it was mentioned. In the remaining 30.6% (4) of the cases, these objectives were considered as failures, at the time of the interviews. It was mostly

because of the internal difficulties of partner firms and/or non-performance by partner firms.

So far, the analysis of performance has been done on the basis of interviews, and on the responses to the questionnaire. However, the research also deal with all the technology transfer variables on the level of performance. Although, the chi-square has been found for all variables, Table 21 lists only technology transfer variables that are significantly related to the level of performance.

Table 21 shows that the organizational learning is very much related to the level of performance. `New design learning', `new process learning', and `new product learning' appear to be related to more significant (level of significant < 0.001) than the `know-how learning' ($\alpha < 0.01$).

In case of strategic objectives, `increase safety' has significant level < 0.01, whereas `increase quality of product', `increase technological learning', `serve present market', and `introduce new product in the same market' have $\alpha < 0.05$. Therefore, these objectives are not independent of the level of firms' performance level.

`Cultural gap' appears to be related to the level of performance ($\alpha < 0.05$), whereas `legal difficulties' is not that significantly related to performance ($\alpha < 0.1$).

## Table 21

Technology transfer variables and performance

| Variables | Chi square value | Level of significance |
|---|---|---|
| **Strategic objectives:** | | |
| Increase quality of product | 4.8 | < 0.05 |
| Increase safety | 9.7 | < 0.01 |
| Increase technological learning | 4.3 | < 0.05 |
| Serve present market | 4.0 | < 0.05 |
| Introduce new products (same market) | 4.7 | < 0.05 |
| **Negotiation:** | | |
| Cultural gap | 4.0 | < 0.05 |
| Legal difficulties | 3.4 | < 0.1 |
| **Organizational learning:** | | |
| Know-how learning | 6.7 | < 0.01 |
| New design learning | 16.7 | < 0.001 |
| New process learning | 13.4 | < 0.001 |
| New product learning | 14.2 | < 0.001 |
| **Legal aspects:** | | |
| Patent (statutory right) | 7.8 | < 0.01 |
| Confidential information (non-statutory right) | 4.0 | < 0.05 |
| Improvement right (rights granted) | 3.6 | < 0.1 |

In case of `basic format of transfer', the Table 21 shows that `patent' ($\alpha < 0.01$), and `confidential information' ($\alpha < 0.05$) perform better than all other forms of transfers.

Obviously, next and last discussing issue to be discussed here concerns the strategic impacts of this technology transfer on the long term performance of the firms involved in the transfer.

Our research shows that 25% of the Indian firms established themselves as leaders in their relevant field because of the availability of high technology. In current economic situation technological leadership is considered to be vital for survival. For some firms, this technology transfer plays a major role in their growth plan. For one firm this project helped to improve their design capability and boost up moral of design team.

For Canadian firms, the long term strategic impact is not that obvious as a supplier of technology. Some firms actually improve their market position because of this technology transfer. However, for some, they not only improve their existing products but also introduce new products to the market.

# CHAPTER IV

## CONCLUSIONS

In this research, the process of technology transfer between a developed (i.e. Canada) and a developing country (i.e. India) was analyzed. From the theoretical framework a model was developed which included the key factors involved in the process of technology transfer. A more detailed analysis of each factor, following the response from the firms, helped to find out the related problems as well as the prospects of technology transfer projects between Canada and India.

The results of this study were briefly reviewed. There were 13 Canadian firms which participated in our study, most of them having their own R & D departments. These firms are mostly privately owned, and came primarily from the service sector.

Our sample consists of 14 Indian firms. Most of them are newly involved in international transaction. As for Canadian firms, Indian firms also have their own R & D facilities. They belong mostly to the public sector companies, and come from manufacturing sectors. However, there is no single Indian firm that belongs to the service sector.

In Canada, small firms are more involved in technology transfer activities, whereas in India, the large firms are mostly engaged in technology transfer transactions.

Most technology transfer occurred between two independent firms. Only one-third of them were sales to the subsidiary or joint venture. Moreover, the technology transfer agreements took place because they had been `technologically pulled' by the Indian firms, and not because they had been `market pushed' there by the Canadian firms.

As we analyzed the objectives of the prospects in both countries we found that the most important objectives for the Indian firms were to increase their technological learning in order to improve the quality of their existing products. As far as the Canadian firms were concerned, they were looking for new markets for export. That is the main reasons they were involved in technology transfer agreements.

Product and process technology were the most common types of technology that was transferred. More specifically, `product design' and `process design' know-how were the most important items of transfer. In a few cases, equipment transfers also took place. Although technical assistance became a very important means of transfer, the knowledge was mostly transferred by blueprints of technological drawings.

Government involvement and legal problems in the recipient country, along with some cultural factors were the most common difficulties encountered in the technology transfer negotiations.

Granting licenses appeared to be the most frequent form of transfer. Patent constituted only 22% of total transfers. Non-statutory rights (i.e. confidential information and know-how/show-how) constituted a big part relating to knowledge transfer.

The most serious problems attached to the transfers were getting the approval from the Indian Government's approval, and its bureaucracy, and also getting the approval from the Reserve bank for transfer of funds in hard currency. Territorial restriction or the restriction on exports to protect the ales against potential competitions were the main form of legal restrictions imposed on the recipient firms.

The installment payments were the most preferred form of payment. However, lumpsum or a fixed amount was generally charged where the duration of the agreement was `not fixed' or was `on-going'.

This research showed that the `new design', `new process', and `new product' learning were crucial for the success of the technology transfer project. Patent and confidential information performed better than other means of transfer.

Often financial inadequacy, and internal difficulties of recipient firms were the main reasons for non-performance of technology transfer projects.

Finally, the following final conclusions can be drawn from our research. Our study suggests that Canadian SMEs are actively involved in technology transfer projects and they are a new source of suppliers of technology to the developing countries, like India.

In the policy field, developing countries seem to benefit from taking initiative in technology transfer, following a careful screening and selection of potential supplier. However, the host country or the enterprise must be prepared to receive and adapt the technology. Financial inadequacies, internal difficulties or poorly managed host firms dominate in the list of unsuccessful stories. Moreover, local Governments could also improve the institutional environment for the transfer by reducing the bureaucracy, simplifying transfer registration procedures, technology legislation, and easing royalty remittances for suppliers.

As to the limitations, our research was confined to the process and its related aspects for technology transfers, i.e. mostly the external aspect of the technology transfer process - and its performance. The fact is that firms using technology in the Third World or developing countries are affected by external and internal environmental factors. Each firm exists within an environment having characteristics which affect, either

positively or negatively, the ability of the firm to plan for long-term development.

Apart from the environment, the research did not deal with another important aspect of technology transfer, i.e. the appropriateness of the transferred technology. Obviously, inappropriate technologies are the ones that are unsuitable to the needs and capabilities of the transferee firms and generally fail due to the structural failures in the transferee countries.

These limitations of our research open the avenues for further research. Besides the environmental study, and the study of appropriate technology in Indian context, the comparative study between multinational corporations and SMEs can be done as suppliers of technology. This type of research can lead us to help and supply more useful, convenient and effective sources of modern technology to developing countries.

# BIBLIOGRAPHY

Al-Ali, S. The Role of Training and Education in Technology Transfer: A Case Study of Kuwait. Technovation, 1991, 11, 3, 133-142.

Alkhafaji, A. Technology Transfer: An Overview as Related to LDCs. Journal of Technology Transfer, 1986, 11, 1, 55-66.

Arbose, J. Making Appropriate Technology Work. International Management, 1979, July, 34.

Balasubramanyam. V.N. International Transfer of Technology to India. Praeger Publication, New York, 1973.

Bommer, M.R.W., Janaro, R.E., & Luper, D.C. A Manufacturing Strategy for International Technology Transfer. Technological Forecasting and Social Changes, 1991, 39, 377-390.

Bozeman, B., & Crow, M. Technology Transfer from U.S. Government and University R & D Laboratories. Technovation, 1991, 11, 4, 231-246.

Buswick, T. Champions of Technology Innovation. Training & Development Journal, February 1990, 48-54.

Carrière, J.B. Transfert de technologie et PME. Collège de Drumond Ville, Université du Québec, 1992, October 20. (Séminaire)

Carrière, J. B. A Strategic Model of Technology and Innovation in Organization. Third International Conference on the Management of Technology, 1992, February 17-21, 1-12.

Contractor, F.J., & Lorange, P. Cooperative Strategies in International Business. D.C. Heath and Company, Lexington, 1988.

Conseil des Denrées Alimentaires du Québec. Transfert Technologique, 1991, March 7, 54-66.

Curtis, G.L. The Textile Negotiations: a Failure to Communicate. Columbia Journal of World Business, Jan.-Feb., 1971.

Crastner, J., & Naiman, J.C. Making Technology Transfer Happen. Research Management, 1978, May, 34.

Deshai, A. V. Technology Absorption in Indian Industry. Wiley Eastern Limited, New Delhi, 1988.

Dhawan, K.C. Telecommunications Technology Transfer to India: A Survey of Canadian firms. Proceedings of the Workshop on Transfer of Western Management Enterprise to Developing Nations, 24-27 Nov., 1986.

Dichter, D., et al. A Guide to Technology Transfer for Small and Medium-Sized Enterprises. International Labour Organization, 1988.

Dorf, R.C., & Worthington, K.K.F. Technology Transfer from Universities and Research Laboratories. Technology Forecasting and Social Changes, 1990, 37, 251-266.

Doz, Y., & Prahalad, C.K. (1980), How MNCs Cope with Host Government Intervention. Harvard Business Review, 1980, March-April, p. 150.

Driscoll, R.E., & Wallender III, H.W. Technology Transfer and Development: an Historical and Geographic Perspective, MN Management Education and Council of America, New York, 1974, p. 4.

Duchastel, L. L'informatique dans les pays en voie de développement: le cas de la Thailand. Université du Québec à Montréal, Sept. 1991. (Mémoire)

Ewing, A.F. UNCTAD and The Transfer of Technology. Journal of World Trade Law, 1976, 10, 197-214.

Fan, Yi-K. Toward a Reconciliation of Conflicting Perspectives on North-South Technology Transfer. Journal of Technology Transfer, 1985, 9, 2, 1-7.

Fforde, J.S. An International Trade in Managerial Skills. Oxford: Blackwell, 1957.

Ford, D., & Rosson, P. Technology Strategy for International Markets: Concepts and Research Approach. Sept. 1986, University of Bath, U.K.

Fried, J., & Molnar, P. Technological and Social Change: A Transdisciplinary Model. Petrocelli Books, New York, 1978.

Garbriel, P.P. The International Transfer of Corporate Skills: Management Contracts in Less Developed Countries, Harvard University, Boston, 1967.

Government of Canada, Office of Industrial Innovation. Supplying or Acquiring Technology: A Canadian Business Guide to Structuring and Negotiating Technology Transfer Agreements. 1986, Report No. 2/86.

Government of India. Export and Import Policy: 1st April, 1992 - 31st March, 1997. Minister of Commerce, March 1992.

Government of India. Handbook of Procedures: 1st May, 1992 - 31st March, 1997. Minister of Commerce, April 1992.

Hayden, E. W., & Nau, H.R. East-west Technology Transfer: Theoretical Models and Practical Experiences. Columbia Journal of World Business, Fall 1975, 70-82.

Husbands, R. Global Experience from Technology Transfer Programs. Small Enterprise Development, 1991, 2, 2, 4-13.

Jolly, J. A., & Creighton, J.W. The Technology Transfer Process: Concepts, Framework and Methodology. Journal of Technology Transfer, 1977, 1, 2, 77-91.

Jorgensen, J.J. Casing the Joint Venture: Three Views on Management Know-how Transfer at Kirloskar - Cummins. Proceedings of the Workshop on Transfer of Western Management Expertise to Developing Nations, 24-26 Nov., 1988.

Kassicieh, S.K., & Radosevich, H.R., A Model for Technology Transfer: Group Decision Support Systems and Electronic Meeting. Journal of Technology Transfer, 1991, 16, 3, 43-49.

Kelley, M. R., & Brooks, H. External Learning Opportunities and the Diffusion of Process Innovations to Small Firms. Technological Forecasting and Social Changes, 1991, 39, 103-125.

Klein, G.A., & Crandall, B. Finding and Using Technology Specific Expertise. Journal of Technology Transfer, 1991, 16, 1, 23-27.

Lall, S. The Patent Systems and the Transfer of Technology to LDCs. Journal of World Trade Law, 1976, 10, 1, 1-16.

Lenac, H. Joint Ventures as Vehicles of Technology Transfer to the Third World. Ph. D. Thesis, New York University, 1985.

Linstone, H.A. Multiple Perspectives on Technology Diffusion. IIASA International on Diffusion of Technologies and Social Behavior, Lacxenburg, Austria, 1989, June 14-16.

Madu, C.N., & Jacob, R. Strategic Planning in Technology Transfer: A Dialectical Approach, Technological Forecasting and Social Changes, 1989, 35, 327-338.

Madu, C.N., & Madu, A.A. A System Approach to the Transfer of Mutually Dependent Technology. Working paper, Pace University, New York, 1988.

Madu, C.N. Prescriptive Framework for the Transfer of Appropriate Technology. Futures, 1990, November, 932-950.

Madu, C. N., Cognitive Mapping in Technology Transfer. Journal of Technology Transfer, 1990, Summer, 33-39.

Muthuchindambaram, S. Technology Transformation: Contextual and Conceptual Implications. (Byrne, E.F., & Pitt, J.C., eds.), Kluwer Academic Publishers, The Netherlands, 1989, 227-248.

Nath, P., & Kumar, S. Industries' Response to the Draft New Technology Policy - A Report. Journal of Scientific and Industrial Research, Nov. 1993, 52, 747-751.

Noisi, J., & Rivard. J. Canadian Technology Transfer to Developing Countries Through Small and Medium-Sized Enterprises. World Development, 1990, 18, 1529-1542.

Noori, H., & Radford, R.W., eds. Readings and Cases in the Management of New Technology and Operations Perspective. Engelwood Cliffs, N.J.: Prentice Hall, 1990, 91.

O'Keefe, T.G. Evaluation Technology Transfer: Some Problems and Solutions, Journal of Technology Transfer, 1982, 6, 2, 53-57.

O'Keefe, T.G., & Marx, H. An Applied Technology Transfer Process. Journal of Technology Transfer, 1986, 11, 1, 83-89.

Organization for Economic Co-operation and Development. Small and Medium Size Enterprises: Technology and Competitiveness. Paris, 1993.

Ozawa, T. Japan Exports Technology to Asian LDCs. Columbia Journal of World Business, 19971, January-February, 66-71.

Peters, J.I. The New Industrial Property Laws in Mexico and Brazil - Implications for MNCs. Columbia Journal of World Business, Spring 1977, 70-79.

Potworowski, J.A. A Technology - Utilization Framework for Developing Countries. Journal of Technology Transfer, Winter 1991, 16, 33-40.

Quin, J.B. Technology Transfer by Multinational Companies. Harvard Business Review, 1969, Nov.-Dec., 147-161.

Rahaman, S.S., & Balcome, D. Canadian Business Linkage with Developing Countries: the Asian experience. International Business Research Center Report, The Conference Board of Canada, 1987, 1.

Ramanujam, V., & Saaty, T.L. Technological Choice in the Less Developed Countries: An Analytical Hierarchy Approach. Technological Forecasting and Social Changes, 1981, 19, 81-98.

Reisman, A., & Zhao, L. A Taxonomy of Technology Transfer Transaction Types. Journal of Technology Transfer, 1991, 16, Spring 1991, 38-42.

Robinson, R. The International Transfer of Technology. Ballinger, Cambridge, MA, 1988.

Rothwell, R., & Dodgson, M.D. European Technology Policy Evolution: Convergence Towards SMEs and Regional Technology Transfer. Technovation, 1992, 12, 4, 223-238.

Rugman, A. M. Multinationals and Technology Transfer: The Canadian Experience. Praeger Publishers, New York, 1983.

Samli, A.C. in Technology Transfer: The General Model in Technology Transfer: Geographic, Economic, Cultural and Technical Dimensions., (Sabli, A.C, ed.), Quorum Books, Westport, CT, 1985.

Siegal, S. Nonparametric Statistics for the Behavioral Sciences, McGraw-Hill Book Co., 1956.

Silverberg, G. Adoption and Diffusion of Technology as a Collective Evaluation Process. Technological Forecasting and Social Changes, 1991, 39, 67-80.

Simyar, F., Argheyd, K., & Larochelle, B. Transfer of Management Technology to Third World Countries: The Case of Iran. Proceeding of the Workshop on Transfer of Western Management Enterprise to Developing Nations, 24-26 Nov., 1988.

Stead, H. Canadian Indicators of the International Transfer of Technology, Statistics Canada, 1987, Report No. ST-87-03.

Stewart, C.T., Jr., & Yasumitsu, Y. Technology Transfer and Human Factors. D.C. Heath and Company, Lexington, 1987.

Skowronski, S. Transfer of Technology and Industrial Cooperation. Technovation, 1987, 7, 17-22.

Stobaugh, R.B. The MNC: Measuring the Consequences. Columbia Journal of World Business, 1971, January-February, 59-64.

Szibbo, A.R. Technology Transfer and the Canadian Business Enterprise Current Law and Evolving Policies Affecting Technology Transfer. Department of Education, The Law Society of Upper Canada, Osgoode Hall, Toronto, 1984.

Technology Atlas Team. Components of Technology for Resources Transformation. Technological Forecasting and Social Change, 1987, 32, 19-35.

Tomilson, J.W.C. The Joint Venture Process in International Business: India and Pakistan. Cambridge, Mass. MIT Press, 1970.

Watanabe, S. Institutional Factor, Government Policies and Appropriate Technologies. International Labor Review, 1980, March-April, p. 171.

Wallender III, H.W. Technology Transfer and Management in the Developing Countries: Company Cases and Policy Analyses in Brazil, Kenya, Korea, Peru, and Tanzania. Ballinger Publishing Company, Cambridge, Massachusetts, 1979.

White, E. Channels and Modalities for the Transfer of Technology to Public Enterprises in Developing Countries, International Center for Public Enterprises in Developing Countries, 1983, Monograph Series 11, 7-45.

Williams, F., & Gibson, D.V. Technology Transfer a Communication Perspective. Sage Publications, London, 1990.

Yong, Y.W., & Keng, K.A. Government and Technology Transfer: The Case of Singapore. International Small Business Journal, Jan.-March 1992, 10, 2, 54-65.

Yourdon, E. A Game Plan for Technology Transfer in Software Engineering Project Management. Computer Society Press of the IEEE, Washington D. C., 1987, 214-217.

## ANNEX-1

## QUESTIONNAIRE

### GENERAL INFORMATION

1. Name of the firm _____
2. Address _____
   _____
3. Phone No. _____ Fax No._____
4. Type of ownership:
   (a) Private ( ): single owner ( ); partnership ( ),
   number of partners ( )
   (b) Public ( ):
5. Size of firm (No. of employees):
   0 - 25 ( )
   25 - 50 ( )
   50 - 100 ( )
   100 - 200 ( )
   200 - 400 ( )
   400 - 600 ( )
   600 -1000 ( )
   >1000 ( )
6. Brief profile of the firm:
   (a) Main products:

| | Name | % of sales |
|---|---|---|
| i) | _____ | _____ |
| ii) | _____ | _____ |
| iii) | _____ | _____ |
| iv) | _____ | _____ |
| v) | _____ | _____ |

   (b) New product(s) introduction (within last 2 years): _____
   _____
   _____
   (c) Export : total sales ratio (if any, before transfer) _____
   (d) Exporting countries _____
   (e) Research and Development Activities:
   i) R & D department: yes ( ); no. ( ), if yes
   No. of technicians _____; No. of engineers _____
   ii) Description of technical development activities _____
   _____
   _____

**Nature of technological transfer:**

7. Brief description of technology transfer with Indian/ Canadian firm _
_____
_____
_____

8. Nature of transaction or business relation in transfer:
   Technical sales agreement between two independent firms ( )
   Sale to a subsidiary ( )
   Joint venture: yes ( ); no. ( ), if yes
   % of ownership _____
   Others (specify) _____

9. Basic format of technology transferred to or from your firm:
   Technical know-how/design ( )
   License ( )
   Patent ( )
   Trade mark ( )
   Equipment ( )
10. Duration of agreement _____

**1. IDENTIFICATION & CONTACT**

1. How was the initial contact made between you and your partner in this transaction:
   a) Who made it: Your firm ( ); Partner firm ( );
      Intermediates (specify) _____
   b) Nature of contact: Phone ( ); Letter ( ); Visit ( ); Bid ( );
      Others (specify) _____
2. Were there other firms also involved: Yes ( ); No. ( ); if yes, on what basis was the selection made _____

**2. STRATEGIC OBJECTIVES**

1. What were your strategic objectives in this technology transfer:

Technological objectives:

| | Not | little Important | Average Important | Important | Very Important |
|---|---|---|---|---|---|
| a) Increase quality of product | ___ | _____ | _____ | _____ | _____ |
| b) Increase productivity of operation | ___ | _____ | _____ | _____ | _____ |
| c) Decrease production costs | ___ | _____ | _____ | _____ | _____ |
| d) Increase safety | ___ | _____ | _____ | _____ | _____ |
| e) Decrease pollution | ___ | _____ | _____ | _____ | _____ |

| | | | | | |
|---|---|---|---|---|---|
| f) Increase diversity of operations | ___ | _____ | _____ | _____ | _____ |
| g) Increase flexibility of operations | ___ | _____ | _____ | _____ | _____ |
| h) Increase in technological learning | ___ | _____ | _____ | _____ | _____ |

Market objectives:

| | Not | little Important | Average Important | Important | Very Important |
|---|---|---|---|---|---|
| a) Answer a request for technology | ___ | _____ | _____ | _____ | _____ |
| b) Serve present products | ___ | _____ | _____ | _____ | _____ |
| c) Serve present markets | ___ | _____ | _____ | _____ | _____ |
| d) Enter into new maket (same products) | ___ | _____ | _____ | _____ | _____ |
| e) Introduce new products (same market) | ___ | _____ | _____ | _____ | _____ |
| f) Enter into new product/market (diversification) | ___ | _____ | _____ | _____ | _____ |

**3. TECHNOLOGICAL FORM AND CONTENT OF TRANSFER:**

1. What were the forms of technology transferred:
   Nature of <u>design know-how</u> transferred (if part of transaction):

| | Not at all | Little | Average | Some | Very much |
|---|---|---|---|---|---|
| a) Plant design know-how | ____ | ____ | ____ | ____ | ____ |
| b) Process design know-how | ____ | ____ | ____ | ____ | ____ |
| c) Product design know-how | ____ | ____ | ____ | ____ | ____ |
| d) Management know-how | ____ | ____ | ____ | ____ | ____ |
| e) Marketing know-how | ____ | ____ | ____ | ____ | ____ |

2. Technical means of transfer:

| | Not at all | Little | Average | Some | Very much |
|---|---|---|---|---|---|
| a) Blueprints of technical drawings | ____ | ____ | ____ | ____ | ____ |
| b) Equipment | ____ | ____ | ____ | ____ | ____ |
| c) Spare parts | ____ | ____ | ____ | ____ | ____ |
| d) Technical assistance | ____ | ____ | ____ | ____ | ____ |

If it was technical assistance, how many persons were involved _____
and for how long _____

3. Nature of before sales services:
   i) Types of services:

| | Not at all | Little | Average | Some | Very much |
|---|---|---|---|---|---|
| a) Technical | ____ | ____ | ____ | ____ | ____ |
| b) Marketing | ____ | ____ | ____ | ____ | ____ |
| c) Financial | ____ | ____ | ____ | ____ | ____ |
| d) Personnel | ____ | ____ | ____ | ____ | ____ |

   ii) Specify _____
   _____
   iii) Number of visits to firm _____

4. Nature of during sales services:
   i) Types of services:

| | Not at all | Little | Average | Some | Very much |
|---|---|---|---|---|---|
| a) Technical | ____ | ____ | ____ | ____ | ____ |
| b) Marketing | ____ | ____ | ____ | ____ | ____ |
| c) Financial | ____ | ____ | ____ | ____ | ____ |
| d) Personnel | ____ | ____ | ____ | ____ | ____ |

   ii) Specify _____
   _____
   iii) Number of visits to firm _____

5. Nature of after sales services:
   i) Types of services:

| | Not at all | Little | Average | Some | Very much |
|---|---|---|---|---|---|
| a) Technical | ____ | ____ | ____ | ____ | ____ |
| b) Marketing | ____ | ____ | ____ | ____ | ____ |
| c) Financial | ____ | ____ | ____ | ____ | ____ |
| d) Personnel | ____ | ____ | ____ | ____ | ____ |

   ii) Specify _____
   _____
   iii) Number of visits to firm _____

## 4. NEGOTIATION

1. What was the length of time between initial contact and the signing of the agreement:

   0 month - 6 months ( )
   6 months - 1 year ( )
   1 year - 2 years ( )
   > 2 years ( )

2. What were the main difficulties encountered during the negotiation:

| | Not at all | Little | Average | Some | Very much |
|---|---|---|---|---|---|
| a) Financial package | ____ | ____ | ____ | ____ | ____ |
| b) Government involvement | ____ | ____ | ____ | ____ | ____ |
| c) Cultural gap | ____ | ____ | ____ | ____ | ____ |
| d) Legal aspects | ____ | ____ | ____ | ____ | ____ |
| e) Rights to improvements | ____ | ____ | ____ | ____ | ____ |
| f) Market uncertainties | ____ | ____ | ____ | ____ | ____ |
| g) Technical requirements | ____ | ____ | ____ | ____ | ____ |

Specify _____

_____

## 5. ROLE OF OUTSIDE AGENCIES:

1. What were the main outside agencies involved in this transfer and what kind of support did they offer:

| | Not at all | Little | Average | Some | Very much |
|---|---|---|---|---|---|
| i) Government Agencies: | ____ | ____ | ____ | ____ | ____ |
| a) Financial | ____ | ____ | ____ | ____ | ____ |
| b) Technical | ____ | ____ | ____ | ____ | ____ |
| c) Marketing | ____ | ____ | ____ | ____ | ____ |
| d) Legal | ____ | ____ | ____ | ____ | ____ |
| Name of agency: _____ | | | | | |
| ii) Universities: | ____ | ____ | ____ | ____ | ____ |
| a) Financial | ____ | ____ | ____ | ____ | ____ |
| b) Technical | ____ | ____ | ____ | ____ | ____ |
| c) Marketing | ____ | ____ | ____ | ____ | ____ |
| d) Legal | ____ | ____ | ____ | ____ | ____ |
| Name of university: _____ | | | | | |
| iii) Trade associations: | ____ | ____ | ____ | ____ | ____ |
| a) Financial | ____ | ____ | ____ | ____ | ____ |
| b) Technical | ____ | ____ | ____ | ____ | ____ |
| c) Marketing | ____ | ____ | ____ | ____ | ____ |
| d) Legal | ____ | ____ | ____ | ____ | ____ |
| Name of association: _____ | | | | | |
| iv) Business Agencies: | ____ | ____ | ____ | ____ | ____ |
| a) Financial | ____ | ____ | ____ | ____ | ____ |
| b) Technical | ____ | ____ | ____ | ____ | ____ |
| c) Marketing | ____ | ____ | ____ | ____ | ____ |
| d) Legal | ____ | ____ | ____ | ____ | ____ |

Name of agency: _____

**6. FINANCIAL DIMENSIONS:**

1. What was the overall investment involved in this transfer: CDN$ _____
   Rs. _____
2. What was the financial package agreed upon:

| | % of contribution |
|---|---|
| i) Government of Canada and agencies | _____ |
| ii) Government of India and agencies | _____ |
| iii) Canadian Bank | _____ |
| iv) Indian Bank | _____ |
| v) Internal financing | _____ |

3. What were the terms of payment ? _____
   _____
4. Were there any fiscal incentives involved for the recipient firm ? _
   _____
5. Were there any export incentives involved for the selling firm ? ___
   _____

**7. TECHNICAL TRAINING:**

1. What was the technical training involved in this transfer:
   a) Technical content of training _____
   _____
   b) How many persons received the training _____
   c) How many persons gave the training _____
   d) How long did the training period last _____
   e) What percentage of training was done at recipient firm _____
   f) What percentage of training was done at seller firm _____
   g) How many visits to the other firms were required _____

**8. LEGAL ASPECTS:**

1. How did you identify your source of legal advice _____
   _____
   Importance of role played by the legal advisers in the overall transfer process:
   Not at all __; Little __; Average __; Some __; Very much ___

2. What main aspects did the transfer agreement relate to:
   i) Statutory rights:
   Patent __; Trademarks __; Industrial designs __; Copy rights ___
   ii) Non-statutory rights:
   a) Trade secrets __
   b) Confidential information __

c) Know-how and 'show-how' (i.e., training and technical assistance) ___

3. What rights were granted:
   Improvement __; Development __; Invention __; Innovation __
4. What limits were imposed _____
   _____
5. What was the main legal difficulties involved in this transfer:_____
   _____
   _____

**9. ORGANISATIONAL LEARNING:**

1. As a recipient or a selling firm what did your organisation learn from this transfer, that could be of use in improving your international competitive position:

| | Not at all | Little | Average | Some | Very muc |
|---|---|---|---|---|---|
| a) Know-how learning | ____ | ____ | ____ | ____ | __ |
| b) New design learning | ____ | ____ | ____ | ____ | __ |
| c) New process learning | ____ | ____ | ____ | ____ | __ |
| d) New producs learning | ____ | ____ | ____ | ____ | __ |
| f) New service learning | ____ | ____ | ____ | ____ | __ |

g) Other types of learning (specify): _____
   _____

2. Were there any in house adaptations required in order to implement technology transfer in your organization:
   Not at all __; Little __; Average __; Some __; Very much ___
   Specify: _____
   _____

3. What differences in technological capacities do you see between your firm and your partner firm:
   Much less __; Less __; Same level __; More __; Much more __

4. Following this technology transfer do you consider that the recipient firm could:
   a) design new and improved products for the local market? _____
      _____
   b) transfer this technology to other firms? _____
      _____

**10. PERFORMANCE:**

1. What is your annual sales level (approx.): CDN$_____or, Rs._____

2. What portion of increase (if any) in your total revenues was attributed to this particular transfer process _____(%)
3. Do you consider that the expected technical objectives of this transaction were achieved? :
   Not at all __; Little __; Average __; Some __; Very much ___
   Reasons:_____
   _____
4. Do you consider that the expected market objectives of the transaction were achieved? :
   Not at all __; Little __; Average __; Some __; Very much ___
   Reasons:_____
   _____
5. Do you consider that the expected financial objectives of the transaction were achieved? :
   Not at all __; Little __; Average __; Some __; Very much ___
   Reasons:_____
   _____
6. What is the strategic impact of this technology transfer on the long term performance of your firms? _____
   _____
7. If you had to go through a similar process in the future what changes would you recommend in order to improve the overall performance of a technology transfer: _____
   _____
   _____
   _____
   _____
   _____

**GENERAL COMMENTS:**

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

We thank you for your kind cooperation.

Dr. J.B. CARRIERE (Professor)
and
Mrs. SUKTI MALDAS (Graduate Student)