Working Paper

EAST–WEST TECHNOLOGY TRANSFER: Basic Knowledge and Reflections

Jaroslav Jirásek and Rita Becker

WP-90-12
April 1990

IIASA

International Institute for Applied Systems Analysis □ A-2361 Laxenburg □ Austria

Telephone: (0 22 36) 715 21 * 0 □ Telex: 079 137 iiasa a □ Telefax: (0 22 36) 71313

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Foreword

This report was commissioned by the International Council for New Initiatives in East West Cooperation (the "Vienna Council"). The rapid economic transition in many East West european countries has brought into sharp focus the need to modernize services, methods, management and specialized skills as well as products and processes in the manufacturing sector.

In spite of the recent expansion of economic cooperation between eastern and western enterprises the economic and technical importance of these joint ventures are of little strategic importance to real economic reform. They are mostly small low-investment and mostly in the low sophistication services sector.

The relevance of the technology to be transferred is of obvious importance in any joint venture or cooperative business arrangement. However, the major reasons for slow progress is rooted in other factors, such as management skills, existence of services and maintenance infrastructure, availability of supplies, availability of transport and logistics, to name a few.

It was to provide some background in these non-technological aspects of technological transfer that prompted this Working Paper. It is in that context that this Working Paper should be viewed.

Dr. Robert H. Pry
Director

Acknowledgments

The current rapid pace of economic transition is quickly rendering many earler data obsolete. An analysis of technology transfer must rely not only on collected data but also on the opinions and deliberations of policymakers, the business community, and experts.

The case studies were based mainly on either direct discussion during visits or on submitted papers. The Polish case study was described in Mr. R. Maciejko's IIASA Working Paper on Joint Ventures in Poland, 1989. Underlying materials were provided by Mr. C Máthé, director of Sancella Hungary, others by the management of FIAT s.p.a., Snamprogetti, AVEX. We are grateful for the support rendered in all case studies. Several were also presented in the press.

Mrs. R. Becker of the Research Centre in Jülich, FRG was most instrumental in collecting data and surveys. The support of Mrs. M. Weinreich and Mrs. C. Fuhrmann of IIASA was valuable in editing the report.

J. Jirásek
Editor

Contents

Foreword iii

Acknowledgments v

Definitions of Technology Transfer 1

Comments on the Available Reports 2

The Growing Volume of Technology Trade and Transfer 2

New Impetus for Technology Transfer in the 1990s 4

CoCom 5

Technology Contracting 5

Transfer Through Licensing 5

Joint Ventures as a Tool for Technology Transfer 6

Technology Centers 7

Intellectual Property Protection and Technology Transfer 7

East–East Technology Transfer 7

Eastern Technology Transfer to the West 7

Countertrade 8

Changes in Information and Proliferation Nexuses 9

Industrial Dimensions 9

Toward a Comprehensive International Strategy of Technological Transfer 9

Recommendations From Some Conclusive Studies 10

Appendix 1: Types of Contractual Arrangements Included in Different Definitions of East–West Industrial (Inter-firm) Cooperation 12

Appendix 2: Categories of East–West Industrial Cooperation and their Definitions 13

Appendix 3: 50 Research-Intensive Product Groups 14

Appendix 4: High Technology Product Groups 15

Appendix 5: A Comparison of High Technology Exports with Total Exports for 15 I.W. Countries 16

Appendix 6: Top Five High Technology Exports 16

Appendix 7: Commodity Composition of Western Exports and Imports 17

Appendix 8: Industries' Shares in Cooperation Contracts 18

Appendix 9: East–West Cooperation by Form 19

Appendix 10: Patents 20

Appendix 11: Trademarks 21

Appendix 12: Patents Granted to Eastern Countries 22

Appendix 13: Licenses 23

Appendix 14: License Imports 24

Appendix 15: A Bibliography 25
- General Literature 25
- On East–West Relations 25
- By Country 27
- By Industry 28

Appendix 16: Case Studies 29

Furnel: A Polish Case Study 29

AVEX: A Czechoslovak Case Study 31

McDonald's in Moscow: A Soviet Case Study 32

Textile Manufacturing Transfer: A Hungarian Case Study 33

Sancella Hungary: A Hungarian Case Study 34

Italian Chemical Manufacturing in the USSR and Hungary: Soviet and Hungarian Case Studies 36

The Long-Range Industrial Agreement FIAT–VAZ: A Soviet Case Study 38

EAST–WEST TECHNOLOGY TRANSFER: Basic Knowledge and Reflections

*Jaroslav Jirásek and Rita Becker**

The story of up-to-date technology transfer started in the 1960s in association with the post-war thaw in international affairs. Since 1965, and particularly in the early 1970s, East–West trade began expanding at a rapid rate. In the main, the policy of "détente" has been credited with the improvement in East–West economic relations. This grew into a substantial subject of international interest in the 1980s.

Present policy options have expanded considerably as a consequence of upheavals in East European affairs. Technology transfer and trade are not exempt from this far-reaching reappraisal. The almost universal penetration of the "new thinking" in international policymaking, associated with considerations of other countries' interests and concerns for stable improvements in global security and prosperity, has endowed international technology transfer with a new creative potential.

Since January 1989, all East European countries have adopted more liberal legal provisions that allow technology transfer to grow and be combined with a capital venture. Several former discrepancies between Western and Eastern approaches to technology transfer were reduced, some disappearing completely. The interest in East–West economic cooperation increased on both sides. The future development of East–West technology transfer will be dissimilar to that achieved in the past. Shifting away from being an auxiliary and peripheral issue, technology transfer will move very much into the foreground.

The number of agreements on East–West Industrial Cooperation (EWIC), e.g., interlinked and jointly operated research, manufacturing, sales, etc., is beginning to multiply. For the time being, some 2,500 large-scale (intermediated or guided by state administration) industrial agreements and 3,200 joint ventures[1] are registered. The EWIC agreement, if put together, make up to some 6–8% of the whole East–West trade.[2] However, technology transfer has not yet taken first priority in East–West economic cooperation.

Definitions of Technology Transfer

The definition of technology transfer (as opposed to mere machinery import/export issues), especially the question of how to define advanced or high technology transfer (see Appendices 1, 2, 3 and 4), is subject to gradual change.

Definitions of technology transfer vary as the subject matter itself evolves, adjusting to changing patterns in the international division of labor, and adopting new features. In the USA and within the framework of the OECD, the following definition (as was approved by the 95th Congress of the United States) is recognized as adequate: "A process whereby innovations (new products and know-how) obtained in one country are then transmitted for use to another." Further explanation of this rather open definition reminds us that it is "essentially a process

*Research Centre, Jülich, FRG.

[1]Including the approximately 700 cases (1988) of "Polonia" ventures, which are joint ventures of a specific nature funded by Polish entrepreneurs abroad.

[2]The growth of the EWIC agreements is expected to follow increased East–West trade (albeit at a slower rate).

Table 1: Exports from Developed Market Economies to East European Countries (in bio $):

Year	Total	Machinery and Transport Equipment	Chemicals
1980	46.3	12.2	6.6
1983	39.5	12.0	4.7
1986	35.7	11.8	5.2

Source: UN Foreign Trade Statistical Yearbook

of transmitting knowledge" and implies an "active role on the part of both transferrer and recipient."

While the terminology "East–West" reflects standard usage, in several cases it would be advisable to distinguish the prevailing direction as being either West–East or East–West and distinguish the OECD or CMEA membership of the transferring and receiving countries.

Comments on the Available Reports

Reports on technology transfer from different authors, sources, and time periods offer little that can be compared internationally. The data of a growing number of reports are derived from various statistical samples, countries, and years. Consecutive research and reporting over a longer time period is rare.

This may be explained not by referring to a low statistical culture (which sometimes leaves much to be desired) but, predominantly by accepting the rapid shift of the political and economic interests, adjustment of priorities, change in the legal, administrative and socioeconomic provisions, rules or codes of conduct, etc. Theoretical reflections on changes that occurred over the past years, especially those after 1989 referring to the completely changed situation, are still on the desks of researchers, experts, or journalists.

The foreseeable trend will prefer higher levels of international economic cooperation, such as joint R&D (R&E) agreements, coproduction (comanufacturing) arrangements and joint ventures (joint stock entrepreneurship).

The Growing Volume of Technology Trade and Transfer

The volume of trade with technology, mainly machinery and equipment, while constantly growing, is still comparatively small.

The framework for the East–West technology transfer could be measured against the total trade flows from developed countries to East European countries. These have not increased in past years (see Table 1):

Science, technology and know-how have become an international trade commodity. They are a most important component of up-to-date manufacturing, its dynamic growth, productive power, and potential for satisfying new needs, and are a major factor in socioeconomic change.

However, their ambiguous potential for civil and defense use constantly impedes international trade. In very many cases their transfer is judged as controversial, as it may lead to the unwanted establishment of a competitive adversary position.

Another survey can be derived from the direct foreign trade between the OECD countries and the CMEA countries (see Table 2):

A stagnant level of foreign trade does not open space for more intensive technology trade. On the other hand, the demand for technological leverage has been growing and, of course, the scope of technologically intensive trade has been increasing constantly. So far, however, the pace has not been remarkable. (See Table 3 and in particular, Appendices 5, 6, and 7.)

While the current volume of technology transfer is far from what would be considered desirable, nevertheless, when well-selected, prepared, and carried out, it has proved to have a

Table 2: Western technology exports to the East (Volume 1970 = 100%).

	1975	1980	1983
OECD capital goods exports to the East:			
– Eastern Europe	209	137	104
– Soviet Union	210	167	270
– Total	210	153	188
OECD intermediate (technology) goods exports to the East:			
– Eastern Europe	183	189	135
– Soviet Union	252	372	394
– Total	208	257	230

Source: OECD East–West technology transfer data base.

Table 3: OECD exports of highly R&D-intensive technology to the East European countries (in percent).

Country	1970	1980	1983
Bulgaria	2.30	3.72	4.64
CSR	3.63	3.35	4.21
GDR	1.94	3.25	2.13
Hungary	3.88	4.55	4.22
Poland	2.48	1.83	3.26
Romania	4.12	–	–
Subtotal	3.20	3.65	4.32
Soviet Union	1.97	1.55	1.80
Total	2.67	2.58	2.73

Source: OECD East–West technology transfer data base (summary of Western statistics).

conspicuous impact on some companies or whole industrial branches.

Another, still more rapid, increase is to be expected after 1989, when new legal and administrative provisions liberalizing economic cooperation come into force. In the fall of 1989 and early 1990, most East European countries accomplished a political and socioeconomic change and are in the process of integrating on an all-European level.

The "seven big" and other OECD countries offer a set of measures facilitating the extension of East–West trade relations (including technology transfer). Most favored nation clause, low interest credits, technical and other important expertize, management consulting and training, etc.

New Impetus for Technology Transfer in the 1990s

Since the 1970s and 1980s, paramount changes in methods of manufacturing seem to have divided European countries.

In the West, dependence on the growth of production of raw material and energy supply was loosened during the 1970s. A new type of "mass and power" saving manufacturing gradually gained momentum.

In the early 1980s, Western countries introduced examples of a new breed of "high technologies" with a new economic, social and ecologic potential, such as "intelligent" automation, biotechnologies, highly effective materials, etc., all supported by informatics and digital telecommunication.

High technologies make it possible to increase production with an unproportionally lower increase of energy and raw materials. They are more environment-friendly and they also address the brain rather than the hands of the working man. Extensive use of high technologies may decelerate the present depletion of natural and human resources.

In the 1970s and 1980s, the technological gap enlarged to a critical extent. This fact was soon manifested in a stagnation of the industrial output and technology conservatism of all East European countries.

The main cause of the decreasing gross output of East European economies is seen not primarily in labor productivity but in the obsolescence and inadequate performance of fixed capital (see Table 4).

East European countries tried, under this technological pressure, to develop modern technological programs. In the mid-1980s, this was primarily "The comprehensive program of scientific and technological progress until 2000" adopted in the CMEA community. The program soon failed without persuasive results.[3]

[3] The initial formulation of the program did not concede to other regional prestigious programs and resembled mostly the core of the Eureka program.

Table 4: Labor and capital productivity in the material sphere (1980–1983). Average annual percentage change.

	Productivity of Labor			Productivity of Capital		
	1960	1980	1983	1960	1980	1983
Bulgaria	7.0	5.5	2.7	−2.5	−2.6	−3.0
CSR	3.2	2.5	1.7	−2.3	−0.3	−2.4
GDR	5.7	4.0	3.7	−1.3	−0.8	−0.8
Hungary	5.1	0.9	1.8	−0.7	−6.9	−3.0
Poland	5.1	−5.2	5.0	−0.2	−7.0	−2.0 (−3.0)
Romania	7.3	2.0	2.8	−1.2	−5.7	−4.0
USSR	4.8	3.2	3.5	0.0	−3.4	−2.6

Source: Economic Survey of Europe, EEC, Geneva 1984 and 1986.

The mid-1980s demonstrate a contradictory development. The commercial barriers are gradually being dismantled and at the same time, the East European countries are trying to overcome the debit burden. With the exception of Czechoslovakia, and lately Romania, debt servicing exercises a prohibitive impact on imports. In spite of the many statements as to the need for high technology, most East European countries have not substantially increased their imports in the high technology sector. In general, the share of the most sophisticated products does not exceed 5%.

CoCom

Multilateral controls imposed by the Coordinating Committee (CoCom) in Paris, whose members are all NATO member countries (except Iceland and Japan), 17 altogether, interferes with a liberal technology transfer. The definition of militarily "sensitive" or "dual-use" technologies has been revised several times, often, however, tightened.

Only in very recent times have the underlying debates on what enhances or threatens national or, in a broad sense, Western security, become more open to recessions. The issue of technology provoking security concerns seem to lose a great deal of its previous inconsistency and dependence on political oscillations. Some East European countries were entitled to imports of advanced technologies under the condition that they would not pass them on to the Soviet Union. Quite recently, the USSR was supplied with advanced computers in the form of a joint venture.

However, CoCom still plays an authoritative role in the technology trade policy and options of technology transfer cannot be chosen without taking its decisions into serious consideration. The CoCom interference can be alleviated but, it would be premature to expect its nullification in the foreseeable future.

Technology Contracting

International trade, including technology transfer, is regulated by international agreements. A survey of the decade 1975–1985 proves that most agreements on cooperation are concluded in the machine building and chemical sector (see Appendix 8).

In the late 1980s, contracting could already make use of the adopted legislative and administrative alleviations, most of which came into full force after January 1989.[4] Contracts on cooperation (in research, development, subcontracting) and coproduction (comanufacturing) have now been shifted more towards complex agreements combining traditional forms with the opportunities for capital venture (Appendix 9).

It is too early to derive conclusions. The new legislation is available but most Western forms are hesitant to enter a business involvement which they consider as not transparent or still hazardous.

East European countries are offering, as an aftermath of the political changes in 1989, an advanced legal protection of the foreign capital investments and new, more liberal, provisions for the retrieval and repatriation of profits.

In the near future one may expect a boom in the joint entrepreneurship and transfer of sophisticated hardware, know-how, and management skills, after which the technology gap could close at a more rapid pace.

Transfer Through Licensing

The international transfer of technology can also be intermediated through licensing. Together with simple foreign aid, cooperation, coproduction agreements, and joint ventures, licensing

[4]See the IIASA Executive Guide for East–West on Joint Ventures published January 1990.

continues to maintain an important role in the process of new technology proliferation and diffusion.

Western countries vigorously entered the license trade in the 1960s. Increased licensing accompanied the growth of the high technology sector of industry (see Table 5).

Table 5: The share of world regions in the license trade (in percent).

	1975		1980	
	Receipts accepted	Royalties paid	Receipts accepted	Royalties paid
World	100	100	100	100
Capitalist countries	98	80	99.1	74.1
Developing countries	–	14	0.5	20.9
Socialist countries	2	6	0.4	5

Source: P. Marer: East–West Technology Transfer. 1968–1980, Paris 1983, p.117; R. Rapacki: Handel, 1987, no.8.

With the extension of foreign subsidiaries and joint ventures, the license trade is supposed to retreat as the transfer shifts to more direct opportunities.

The number of licenses purchased by Eastern countries and the size of royalties paid is difficult to reconstruct from the available figures. CMEA sources estimate royalties paid at approximately 360 million US$ annually. (For the development of West–East licensing in general terms, see Appendix 12.)[5]

Licensing agreements often involve further purchases of materials, tools, and machinery, the volume of which may far exceed the license trade-offs. Some indicators showing the intensity of patent applications and patent grants are given separately (see Appendix 10, 11).

Joint Ventures as a Tool for Technology Transfer

Since January 1989, liberalization of joint ventures has been legally adopted in most East European countries. In the fall of the same year, approximately 3,200 joint ventures were registered in the USSR, Poland, Hungary, Czechoslovakia and Bulgaria. Vested capital amounts to almost 5 billion US$ (of which slightly more than 40% is from the West).

It was presumed that joint ventures would be a powerful vehicle for technology transfer as the potential for transfer seems undeniable. This, however, has not yet been fully disclosed. Less than 10–15% of joint ventures are associated with a kind of substantial technology transfer. Enhanced technology applications are typical for Czechoslovak and Hungarian joint ventures. (This also applies to joint ventures in the GDR, albeit the country does not have any joint venture legislation and approves joint capital venture from case to case.)[6]

There are opportunities to exploit joint ventures far more in order to promote the transfer of advanced products and methods of manufacturing. Elaboration of international strategies of joint ventures (including technology transfer) should be supported. Up to now, most joint ventures have been judged as a commercial transaction, insufficiently linked with problems of technological leverage.

[5]Some research work indicates contradictory data. See a critical evaluation in J.C. Brada: Technology Transfer between the United States and Communist Countries, in: Research in International Business and Finance, JAI Press, Greenwich, 1981.

[6]A newly prepared legislation is supposed to be subject to further amendements in association with the reunification of Germany.

Technology Centers

In several "technological parks" (areas of conglomerated research institutes, development and experimental facilities, and advanced manufacturing) regional or municipal authorities and civic initiatives have established "technological centers" in order to support technology transfer and implementation and to promote local entrepreneurialship.

It is advisable to introduce similar institutions into East European countries in order to facilitate technological initiative in general and technology transfer into medium size and small enterprises in particular.[7]

Intellectual Property Protection and Technology Transfer

Another factor expected to boost international technology transfer is the growing concern of countries to protect intellectual property rights, i.e., patents and copyrights. As clones of patents or copyrights are being prosecuted more now than ever before, more countries are adopting identical, internationally recognized provisions to protect intellectual property rights. Technology transfer remains a legitimate way of distributing advanced technology (see Appendix 13,14).

In a time of extensive informatics and telecommunication, copyright protection in particular is becoming a subject of new concern. The Office of Technology Assessment of the US Congress tried to estimate losses by US firms due to copyright infringement (1984): the total amounted to 1330 million US$ of which two-thirds were in records, tapes, and software.[8] The figures are valid for ten developing countries of Asia and Africa only. Through extrapolation one may appraise the total losses of OECD countries somewhere around five billion US$ in 1984 and double that amount in 1988 (associated with an exponential growth of informatics in the meantime). The OECD countries have strengthened property laws and mechanisms of enforcement.

East–East Technology Transfer

The East–West (or West–East) directions of technology transfer are developing along the East–East (and West–West) technology exchange, based on different principles and rules. The intra-CMEA exchange of "science and technology" is not believed to considerably foster trade with high technology hardware and know-how. A new initiative (1988) to develop the so-called "direct relations" (i.e., advocating not governmentally intermediated but inter-enterprise direct agreements on joint research and development/experimenting, coproduction or joint capital ventures) which are regarded as particularly fruitful for technology transfer among CMEA member countries, brought into existence some 1500 such agreements as of January 1, 1989. However, as a whole, they do not exceed 1% of the mutual trade of either respective country.[9]

Eastern Technology Transfer to the West

There has always been a certain small amount of technology transfer from East to West, mostly in the form of successful research results or inventions. However, completely new dimensions of technology transfer from the East were opened when the Soviet Union offered a number of military research results for civil implementation in the West and other East European countries followed.

[7] Certain positively conclusive experiences were made in the USSR, such as the "scientific town" of Novosibirsk or in the qualified "scientific park" of Zelenogorsk.

[8] OTA, Intellectual property rights in an Age of Electronics and Information, Washington, D.C., 1986.

[9] After political upheavals in East European countries, many of these agreements are believed to have been subject to cancellation.

This type of industrial "spin-off" was limited in the past to national boundaries or countries of the same military blocks. In some countries, this opportunity has been well accepted and is practically applied, for instance in the FRG, Finland, Italy, and others.

Countertrade

Since the mid-1970s the growth of countertrade practices has attracted the attention of observers of the East–West trade. Due to the steep increase in foreign debts in most East European countries, trade compensation has been gradually identified with countertrade operations in general and with short-term buy-back (counterpurchase) arrangements in particular. These countertrade practices were so extensive that a variety of trade contingencies were developed, such as occasional one-time deals between firms; long-term arrangements of counter-deliveries between firms; turn-key contracts of deliveries of complete industrial plants to be compensated by later deliveries of the plant(s) products; industrial cooperation and coproduction; multi-firm or long-term compensation agreements between the governments, etc.

In the 1970s, the proportion of countertrade was estimated at some 10–20%. Since then the share has grown to approximately 40–60%. In his analysis of countertrade practices, the OECD Secretariat emphasized that certain disadvantages of countertrade are generally understated. (See Table 6.)

The growing debt burden in most East European countries has led to one-sided measures for preserving a commodity trade balance. These countries tend to look at industrial compensation as a sempiternal way in which to conduct their foreign trade, thus postponing and impeding actions toward their currency convertibility. Many Western firms also complain of the impact on the size and length of trade contracts under countertrade rule.

Table 6: Countertrade trends.

Country of imports	Volume of Western exports contracted under a countertrade arrangement ($ mio)		
	1969–75	1976–80	Total
Bulgaria	99	10	109
Czechoslovakia	103	160	263
GDR	178	3523	3601
Hungary	186	453	639
Poland	3482	1895	5377
USSR	7388	12418	19806

Source: Countertrade, OECD Publications, 1981, Table 1.

Remarks:

1. Only the 290 agreements which the OECD Secretariat was able to identify are included. The trends alone may be taken for granted.
2. In the case of Poland the increase of the "Polonia" ventures is responsible for the rapid growth of countertrade, whereas in the GDR, it is the inner trade (Binnenhandel) which will be taken mostly into consideration.
3. In some countries the counter-deliveries were specifically associated with certain industries. In the USSR, fuel exceeds 60% of the total compensation. Chemicals and heavy machinery in the GDR and Poland and consumer goods in Hungary, represent approximately half the compensation.

Changes in Information and Proliferation Nexuses

The usual consensus is that the growth potential of technology transfer depends on the knowledge available and on its utilization. Information is the most pervasive tool with which to generate an awareness of the technological gap and improve technological planning.

Technology as a commodity is traded in many diverse forms, such as capital or consumer goods (technological hardware), technological information (software), technological and related services. According to the diversity of technology trade, information options are also distributed via journals, articles and books, circular letters, patent documents, analytical studies, consultancy, teaching and trading. Very much depends on mutual acquaintance, confidence and credibility. Technological trade is signified by a high complexity of matters and requires a great deal of professionalism and negotiation capabilities.

The protagonists of technology transfer used to be: specialized firms for technology trade; scientifically based or technologically advanced hi-tech firms; universities and research institutes; engineering firms; chambers of industry and/or commerce; technical departments of state bodies (administration, police, army) and local administration.

New institutions of technology diffusion have come into existence and are growing in importance and size. Included are: technology data (information) bases; branch-bound or local technology centers; "born-in," "spin-off" or "multiplication" engineering services; advanced technology training centers (able to continue with a professional consultancy).

In previous years some civic initiatives were also concerned with technology information and distribution, for instance associations and clubs for technology enlightenment and guidance; youth associations for scientific and technological activities; many exhibitions with wider programs, etc.

Technology is a factor of major socioeconomic change. Differences in technology devolve into business, social, cultural or environmental values. No country can afford to leave technology advancement to the engineering community alone.

Industrial Dimensions

The dimensions of the technology transfer are distributed in an uneven way. Some industries are not yet quite covered by the technology transfer achieved in traditional industries, which need considerable modernization, i.e., coal, oil, power generation, and steel industries.

Technology transfer is most welcome in hi-technologies such as new materials, alternative energy resources, industrial automation, robotics, computers, telecommunication, biotechnologies, ecotechnologies, etc.

Prior to the 1970s, the majority of high tech transfer applied to the machine building industry: mechanical, electrotechnical (including electronics) and transport. No item, however, exceeded 5% of the total export mark. Usually the intensity and dimensions of the technology transfer are associated with political stability, economic potential and policy making of the countries. After 1989, a turnover year which cannot yet be interpreted in statistical terms, the Eastern countries are credited with much more favorable conditions and predictability of technical, political and economic interlinks.

Toward a Comprehensive International Strategy of Technological Transfer

The majority of the technology transfer tends to be limited in size and have a short-term impact. However, where the technology transfer is converted into a permanent manufacturing cooperation, coproduction or joint venture, the initial impact may be "snowballed" at an accelerated pace. The impact of the technology transfer depends on several preconditions, such as political stability, economic benefits, managerial potential, culture, skills of the workforce and others. There are many examples showing that multi-factoral analysis and decision-making may provide different results depending on the systems approach and long-range vision of the technology transfer. Obviously, technology transfer has attained the threshold of an urgently needed internationally well-balanced and carefully elaborated long-range strategy. It should be promoted among the priority issues of the new internationalism of our times.

Recommendations From Some Conclusive Studies

Many studies on technology transfer are already available (see Bibliography in the Appendix). A new recognition should be attributed to the studies under the auspices of the OECD and EC. Several studies have been accomplished by research institutions with a wide international field of activities. Studies carried out within the framework of the CMEA are lesser known[10] but are credited with revealing some findings different to those in the West.

Based on the active OECD contribution, some conclusive knowledge can be summarized. Econometric case studies under the sponsorship of the OECD highlighted, in general terms, the fact that West–East technology transfer has made a significant contribution to the technological advancement of some companies and whole industries. At the same time, the studies carried out revealed several inhibiting factors, among them being:

- the transfer presumes good professional preparatory measures in advance;
- advanced technology is to be transferred with the professional know-how with which it is associated (in the case of computer technology this could be expressed in terms of a complementarity of hardware and software);
- the recipient country is to develop an adequate infrastructural environment;
- careful attention should be paid to the differences in the economic, social, cultural, environmental position, regulation and value orientation.

The OECD studies reveal some generic impeding factors causing a low economic efficient of technology transfer in East European countries. Many of them can be confirmed not only as research findings but widely admitted in the official reports of their respective countries, such as:

- a different set of values to define the "success" of the transfer (market vs. non-market evaluation) including a lower interest in innovations among the top-management;
- underdeveloped consulting and engineering services, commercial banks, insurance institutions;
- deficiencies in tool, material supply, transport and communication; shortage of flexible subcontractors;
- low level of CAD/CAM implementation;
- lower plant or factory performance, quality and cost standards, less self-reliance on auxiliary tasks such as setting the machinery, material handling, storage, planning and control, etc.;
- lower propensity of managers and engineering personnel to take responsibility and make use of cost-benefit analysis (economically sound decisions);

[10] East–West Technology Transfer, OECD, Paris 1984.

- excessive time required for decision-making by governmental or other administrative authorities,
- lack of "venture" capital ("venture" banks).

The still modest contribution of East European studies, while confirming many of the OECD research results, presents some dissenting critical statements:

- technology transfer from the West is often some five years obsolete;
- in several cases the transfer is incomplete (sometimes in order to involve further deliveries) inducing another kind of dependence (on supplied tools, material, maintenance, etc.);
- the transferring firms do not pay enough attention to the difference in socio-economic environments, to the need for instruction and training, technical consulting and assistance;
- most receiving countries would welcome a countertrade arrangement, however, very few trading companies are in a position to negotiate.

In other words, as the complaints indicate, the technology transfer is not understood from the point of view of closing the technological gap and developing a broad market with an advanced network of supplier and clients, but still extensively from the exclusive point of view of a business case and commercial rewards.

Appendix 1

Types of Contractual Arrangements Included in Different Definitions of East-West Industrial (Inter firm) Cooperation[a]

1. Sale of equipment for complete production systems, or "turnkey" plant sales (usually including technical assistance).
2. Licensing of patents, copyrights and production know-how.
3. Franchising of trademarks and marketing know-how.
4. Licensing or franchising with provision for market sharing and quality control.
5. Co-operative sourcing: long-term agreement for purchases and sales between partners, especially in the form of exchanges of industrial raw materials and intermediate products.
6. Sub-contracting: contractual agreement for provision of production services, for a short-term and on the basis of existing capabilities, but often to design specifications furnished by the contractor. Some or all components also frequently supplied by contractor.
7. Sale of plant, equipment and/or technology (1-3 above) with provision for complete or partial payment in resulting or related products.
8. Production contracting: contractual agreement for production on a continuing basis, to partner specifications, of intermediate or final goods to be incorporated into the partner's product or to be marketed by him. In contrast to sub-contracting, production-contracting usually is on the basis of a partially transferred production capability, in the form of capital equipment and/or technology (on basis of a license or technical assistance contract).
9. Co-production: mutual agreement to narrow specialization and exchange components so that each partner may produce and market the same end product in his respective market area. Usually on the basis of some shared technology.
10. Product specialization: mutual agreement to narrow the range of end products produced by each partner and then to exchange them so that each commands a full line in his respective market area. In contrast to co-operative sourcing, product specialization involves adjustment in existing product lines.
11. Co-marketing: agreement to divide market areas for some product(s) and/or to assume responsibilities for marketing and servicing each other's product(s) in respective areas. Joint marketing in third markets may be included. Does not in practice stand alone, unless in the form of a joint marketing company (i.e., combined with 14 below). Otherwise combined with various forms, especially 4, 8, 9, 10.
12. Project co-operation: joint tendering for development projects in third countries.
13. Joint Research and Development: joint planning, and the coordinated implementation, of R & D programs, with provision for joint commercial rights to all product or process technology developed under the agreement.
14. Any of the above in the framework of a specially formed mixed company or joint venture between the partner firms (on the basis of joint equity participation, profit and risk sharing, joint management).

a) The terminology used here is not standard, and the types are variously designated in the literature. For example, the term "production-sharing" is sometimes used to designate all or some of types 8 through 10. For more extensive definition, discussion and illustration of the many types of arrangement included in this table, but using somewhat different terminology, the interested reader is referred to *Rapport analytique sur la coopération industrielle entre les pays de la CEE* Economic Commission for Europe, United Nations, Geneva, 1973, and St. Charles, D.P., "East-West Business Arrangements: Typology", in Carl H. McMillan (ed.), *Changing Perspectives in East Commerce*, Heath-Lexington, Lexington, Mass., 1974.

Source: Carl H. McMillan, "East-West Industrial Co-operation" in *East European Economies Post Helsinki, op. cit.*, p. 1182.

Appendix 2

Categories of East-West Industrial Co-operation and their Definition: a Comparison of Schemes used by Paul Marer and Joseph C. Miller and by the United Nations

Category and Definition Used	ECE Definition
1. Scientific-technical agreement (STA) are signed between a US corporation and the Soviet State Committee for Science and Technology (or its counterpart in an EE country) to explore what technology or know-how might be exchanged subsequently, on a commercial basis. While STAs are not commercial contracts, they are of interest because they identify industries and projects where the Eastern partner intends to obtain Western technology and where US firms have both an interest and a capability to compete.	Category not included.
2. Know-how (K) is transferred under a technical assistance contract. Only if such a contract was signed on its own, rather than as a component of a license or equipment sale or more complex forms of IC, was it included as a separate category.[a]	Category not included.
3. Licensing (L), regardless of the means of payment. L is not shown separately if it occurred as part of a more complex transaction, such as turnkey, co-production or joint venture, to avoid double-counting the number of agreements or projects. "L-direct" records transactions by a US-based firm directly; "L-indirect" records transactions carried out by a European, Canadian, or Japanese subsidiary or affiliate.[b]	Licensing (L) with payment in resultant products.
4. Turnkey (TK) includes all contracts where the supplier has significant on-site installation or supervision responsibilities, namely: prime contractor; contractor (US firm is one of several contractors but agreement is directly with the host country); and subcontractor (supplies machinery and equipment under subcontract and has on-site installation/training responsibilities.	Turnkey (supply of complete plants or production lines) with payment in resultant products (Subcontractors are not included).
5. Subcontracting (SC) in the Eastern country, with the Western partner usually providing the technical know-how and sometimes the machinery, equipment, and parts.	Same.
6. Co-production (CP) each partner specializes either in the production of parts of a product assembled by one or both partners or in the production of a limited number of finished products exchanged to complete each partner's range of products.	Same.
7. Joint ventures (JV) co-ownership of capital, co-management, and sharing of risk and profit, if the JV is located on the territory of the Eastern partner.	Same, plus including joint marketing ventures typically located in the West which market products of the Eastern country.
8. Category not included (no known US cases).	Joint Tendering or Projects (JTP) supply of complete plants or production lines to a third Western party.
9. Reverse Licensing (RL): US firms is importing a license. This category is not part of the total.	Category not included.

a) It is useful to distinguish know-how (1) to make; (2) to operate and maintain; and (3) to apply. Whereas a license and a patent normally cover what can be put on paper, know-how is less readily rendered on paper, rather it must be demonstrated.

b) This study shows separately licensing with payment in cash, in resultant product, and payment not speficified.

Source: Paul Marer, Joseph C. Miller, "US Participation in East-West Industrial Co-operation Agreements" in: *Journal of International Business Studies*, Fall-Winter, 1977, pp. 28-29.

Appendix 3

50 Research Intensive Product Groups (1970)

SITC Index	Product Group
071.3	Coffee essences, extracts
122.2	Cigarettes
•231.2	Synthetic rubber
431.2	Hydrogenated oils, fat
•512.86	Sulphonamides
•513.2	Chemical elements n.e.s.
•513.5	Metallic oxide for paint
•515.1	Radio-active elements
•531.01	Synthetic organic dye
533.3	Prepared paints, enamels, lacquers, etc.
•541.63	Sera, vaccines
•541.3	Antibiotics
•599.75	Anti-knock preparations
551.2	Synthetic perfume and flavour materials
•571.1	Prepared explosives
581.31	Vulcanized fibres
629.4	Rubber belting
655.5	Elastic fabrics and trimmings of elastic
675.03	Alloy steel, hoop and strip
678.2	Tubes and pipes of iron and steel, seamless
691.2	Finished structural parts and structures of aluminium
695.24	Tools for use in hand or machine
•695.26	Carbide tool tips, etc.
698.11	Locks and keys
•861.1	Optical elements
•861.5	Cinema cameras

SITC Index	Product Group
•861.7	Medical instruments
•861.9	Measuring and controlling, scientific instruments
862.4	Photo film
•891.1	Sound recorders
899.97	Vacuum flasks
•266.3	Regenerated fibre to spin
711.3	Steam engines, turbines
711.81	Water engines and turbines
•714.2	Calculating and accounting machines
•715.1	Metal cutting tools
715.23	Welding machinery
•718.22	Type setting machinery
718.3	Food processing machines
718.5	Mineral crushing etc., and glass working machines
719.15	Refrigerating equipment, non-domestic
719.32	Fork lift trucks
	Packaging and filling machines
719.62	Ball, roller bearings
•719.7	Telecommunications equipments n.e.s.
*724.9	X-ray apparatus
•736.2	Batteries and cells
•729.11	Transistors, valves, etc.
•729.3	Electric measuring and control
•729.5	equipment
*732.4	Special motor vehicles

• Research Intensive Product Groups *within* the Research Intensive Industries

Source: Gaps in Technology — Analytical Report, OECD, Paris, 1970, Book III, Appendice 2, pp. 231-232

Appendix 4

High Technology (1977)

SITC heading or subheading	Groups of Products	SITC heading or subheading	Groups of Products
71142	Jet and gas turbines for aircraft	72911	Primary batteries and cells
7117	Nuclear reactors	7293	Tubes, transistors, photocells, etc.
7142	Calculating machines (including electronic computers)	72952	Electrical measuring and control instruments
7143	Statistical machines (punch card or tape)	7297	Electron and proton accelerators
71492	Parts of office machinery (including computer parts)	7299	Electrical machinery, n.e.s. (including electromagnets, traffic control equipment, signalling apparatus, etc.)
7151	Machine tools for metal		
71852	Glass-working machinery	7341	Aircraft, heavier than air
7192	Pumps and centrifuges	73492	Aircraft parts
71952	Machine tools for wood, plastic, etc.	7351	Warships
		73592	Special purpose vessels (including submersible vessels)
71954	Parts and accessories for machine tools	8611	Optical elements
71992	Cocks, valves, etc.	8613	Optical instruments
7249	Telecommunications equipment (excluding TV and radio receivers)	86161	Image projectors
		8619	Measuring and control instruments, n.e.s. *)

Source: Quantification of Western Exports of High Technology Products to the Communist Countries, Office of East-West Policy and Planning, Bureau of East-West Trade, 17th October, 1977, pp. 4 and 14.

*) Some items which might well contain high technology products have not been included in this list:

7111	Steam-generating boilers	8614	Photographic cameras
71181	Water turbines	8624	Photographic plates, film, etc.
71822	Type making and setting machinery	8641	Watches
71994	Metal-plastic joints (gaskets)	8642	Clocks
726	Electromedical and X-ray apparatus		

**) The definition of the High Tech sector ist constantly changing. For instance, in the second half of the 1980s among prominent items new materials, industrial optics, biotechnology, etc. are to be found.

Appendix 5

Comparison of high technology exports with total exports of fifteen I.W. countries to the world* and to the Eastern Countries in 1972 and 1977.
(in millions of US dollars)

	1972			1977		
	Total	High Tech	%	Total	High Tech	%
USSR	3317	582	17.5	11412	2003	17.5
Eastern Europe	5098	619	12.1	12866	1741	13.5
Yugoslavia	2117	270	12.8	5407	801	14.8
Cuba	257	27	10.5	993	93	9.4
China	144	64	4.5	3585	248	6.9
Total Social.Countries	12234	1562	12.8	34263	4886	14.3
Total - World	273045	29092	10.7	669393	71567	10.7

* I.W. Countries: USA, Canada, Japan, Belgium-Luxembourg, France, F.R.Germany, Italy, Netherlands, Austria, Norway, Sweden, Switzerland, U.K., Denmark. Eastern Europe: Bulgaria, CSSR, German Dem.Rep., Hungary, Poland, Rumania, USSR.

Source: John P. Young: Quantification of Western Exports of High Technology Products to the Communist Countries, op. cit. p. 10.

Appendix 6

Top five high technology I.W. exports to the Eastern countries in 1977.

SITC		Value ($ Millions)	1977 % of total High Tech exports	% of total exports
7151	Machine tools for working metal	1257	25.7	3.7
7192	Pumps and centrifuges	775	15.9	2.3
7299	Electrical machinery and apparatus, n.e.s.	560	11.5	1.6
71992	Taps, cocks, valves, n.e.s.	495	10.1	1.4
72952	Electrical measuring and controlling instruments, n.e.s.	307	6.3	0.9
	Top Five Total	3394	69.5	9.9

Source: John P. Young, Quantification of Western Exports of High Technology Products to the Communist Countries, op. cit. p. 12 and 2nd draft 1979, p. 12.

Appendix 7

Commodity Composition by Factor Intensity of Western Exports and Imports from Eastern Europe and the Soviet Union

Total exports and imports = 100

		Capital-intensive products		Labour-intensive products		Natural resource-intensive products		Technologically advanced products	
		Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
		In per cent							
Eastern Europe and USSR									
1965-1969		12	15	17	12	23	64	48	9
1973-1977		19	20	16	15	19	53	46	12
of which: 1976-1977		18	21	15	17	18	50	49	12
Soviet Union									
1965-1969		11	19	22	7	18	69	49	5
1973-1977		23	27	15	6	18	60	44	7
of which: 1976-1977		21	25	15	8	17	60	47	7
		Trade Balance (f.o.b. - f.o.b.) (in $ million)							
Eastern Europe and USSR	Total								
1965-1969	39	−93		217		−1 728		1 643	
1973-1977	5 967	1 092		1 023		−4 374		8 226	
of which: 1976-1977	6 879	814		852		−4 990		10 203	
Soviet Union									
1965-1969	−315	−198		232		−1 078		729	
1973-1977	2 237	200		1 016		−2 928		3 949	
of which: 1976-1977	2 938	251		1 095		−3 780		5 372	

Source: *Economic Bulletin for Europe* Vol. 30, No. 1 pre-publication text, Table B.8. The layout of this table has been rearranged to conform with that of Table 1. The definition of the groups is not the same in the two tables. The definitions for this table are as follows

Appendix 8: **Industries' share in the total number of industrial cooperation contracts, by country.** (in percent)

Country	TOTAL	Chemicals industry	Metal-lurgy	Transport equipment	Machine tools	Mechanical engineering	Total	Elec-tronics	Electrical equipment	Total	Food and agriculture	Light industry	Total	Other branches
	%	2	3	4	5	6	5+6	7	8	7+8	1	9	1+9	10
Total														
1976	100	23.8	7.9	12.6	3.5	22.0	25.5	7.5	6.0	13.5	5.2	6.5	11.7	5.0
1984	100	22.5	6.5	11.3	5.5	14.4	19.9	7.4	8.3	15.7	6.8	10.8	17.6	6.5
Bulgaria														
1976	100	25.0	5.7	14.3	2.9	28.5	31.4	2.9	5.7	8.6	17.3	--	17.1	2.0
1984	100	9.1	4.5	6.8	4.5	25.0	29.5	11.4	6.8	18.2	9.1	20.4	29.5	2.3
CSSR														
1976	100	22.7	--	22.7	9.1	36.4	45.5	--	9.1	9.1	--	--	--	--
1984	100	8.7	--	11.6	16.0	21.7	37.7	2.9	14.5	17.4	10.1	11.6	21.7	2.9
GDR														
1976	100	23.5	23.5	6.0	17.6	17.6	35.2	--	5.9	5.9	5.9	--	5.9	--
1984	100	15.1	6.1	27.3	9.1	18.2	27.3	9.1	--	9.1	3.0	9.1	12.1	3.0
Hungary														
1976	100	17.5	3.6	13.3	4.8	20.5	25.3	7.2	10.8	18.0	4.2	12.1	16.3	6.0
1984	100	18.2	3.1	8.6	4.8	11.7	16.5	7.6	14.1	21.7	8.9	15.8	24.7	7.2
Poland														
1976	100	23.4	11.3	10.5	4.8	23.4	28.3	9.0	5.6	14.6	1.6	4.0	5.6	6.4
1984	100	17.7	12.5	15.6	2.1	18.7	20.8	12.5	5.2	17.7	4.2	6.2	10.4	5.2
Rumania														
1976	100	20.5	7.1	22.5	--	30.6	30.6	6.1	2.0	8.1	4.1	3.0	7.1	4.1
1984	100	34.2	10.5	34.2	--	--	--	5.3	2.6	7.9	2.6	5.3	7.9	5.3
USSR														
1976	100	12.1	9.7	7.7	1.5	15.8	17.3	9.7	3.6	13.3	7.2	7.6	14.8	5.1
1984	100	35.0	9.9	7.8	5.3	13.6	18.9	5.8	3.3	9.1	4.9	5.8	10.7	8.6

LEGEND:
1. Food and agriculture industry (including beveraeges)
2. Chemicals industry (including pharmaceuticals)
3. Metallurgy (including mining)
4. Transport equipment: Includes aircraft, automobiles, lorries, tractors (even for agriculture), rolling stock, earth-moving equipment, diesel engines (even stationary)
5. Machine tools
6. Mechanical engineering (all other non-electrical engineering)
7. Electronis (computers and other office equipment, radio and television sets, communication equipment)
8. Electrical equipment (all other equipment including electric locomotives and household appliances)
9. Light industry (textiles, footwear, rubber, glass, furniture, consumer goods)
10. Other, such as construction, hotel management, tourism, etc.

Source: Promotion of Trade Through Industrial Cooperation, Statistical Outline of Recent Trends in Industrial Cooperation, 1976: TRADE/R.355, 1984: TRADE/R.487.k

Appendix 9

Cooperation of CMEA countries with capitalist countries according to the form of it.
(in percent)

	1972	1975	1977	1979	1980	1981	1983	1986
License agreements	28.2	26.1	17.1	15.0	15.6	13.6	13.6	12.1
Deliveries of manufacturing plants	11.9	21.7	20.5	20.0	19.9	19.6	17.8	15.2
Cooperation with industrial machine parts	30.2	33.3	38.3	39.1	38.5	41.7	13.6	41.2
Subcontracting	7.9	6.8	7.4	3.3	2.6	2.4	2.4	3.0
Joint Ventures	--	2.9	10.5	13.1	12.6	12.7	12.3	17.0
Tripartite cooperation	--	9.1	6.3	9.5	10.7	10.3	10.3	11.4
Total:	100	100	100	100	100	100	100	100

Source: Strany SEW, Moscow 1982, p. 195 and 1986, p. 199.

PATENTS (in units)

Country	Applications				Grants				In force			
	1975	1981	1982	1983	1975	1981	1982	1983	1975	1981	1982	1983
Austria	9911	5818	4853	4667	7018	5480	4061	3815	58414	48806	45703	42311
Bulgaria	688	365	340	340	522	240	169	165	2038	2119	--	--
Canada	25652	25498	25293	25707	20544	22696	23147	20999	412704	414267	413639	409955
Czechoslovakia	2315	1351	1267	1077	1950	1350	1350	850	--	--	--	--
Finland	3761	4232	4545	4897	1361	2050	2057	2224	7147	9049	9646	10179
France	40437	24668	22242	21176	14320	21477	23944	25043	351912	305306	285848	264556
German Dem.Rep.	7273	9597	10138	12129	6662	7447	5304	7780	--	--	63615	--
Germany,Fed.Rep.	60095	46579	47826	47103	18290	13429	16306	20913	125863	--	136723	137220
Hungary	2954	3652	3903	4290	1838	1604	2129	2433	12201	13595	15072	15977
Italy	--	14843	--	12080	--	6500	--	1049	--	--	--	--
Japan	159821	216307	235324	252685	46728	50904	50601	54701	--	407633	404293	419143
Netherlands	15267	6125	5085	4500	3845	3058	6653	8361	22311	22851	28043	32403
Poland	9186	5558	5472	5524	10015	6102	4463	4402	--	28315	26462	24679
Sweden	14799	7882	7529	7241	9100	4882	7864	8617	61600	47447	48803	50417
USSR	4719	2595	2418	2027	2086	1716	1414	1291	10012	12582	12043	11449
USA	101014	106413	109625	103703	71994	65770	57889	56862	1060230	1141637	1199526	1193527

Source: World Intellectual Property Organisation, Geneva.

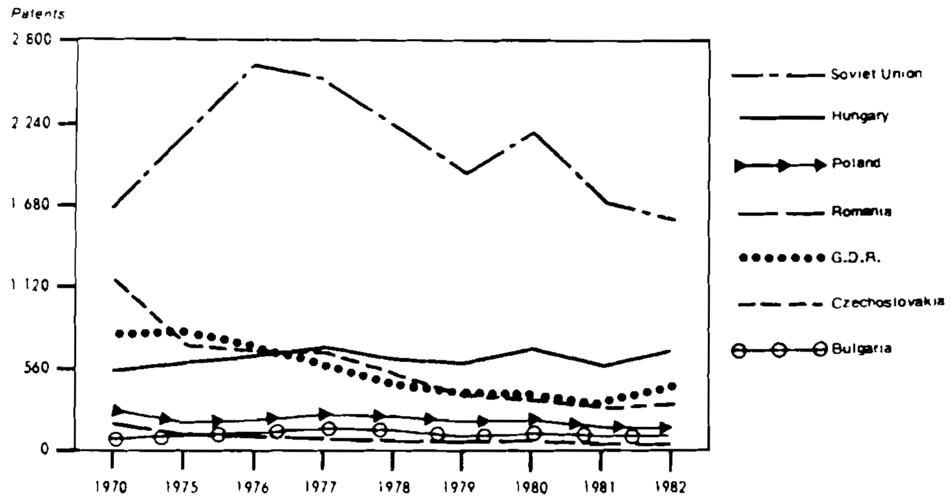
TRADEMARKS (in units)

Country	Applications for registrations				Registrations granted				Registrations in force			
	1975	1981	1982	1983	1975	1981	1982	1983	1975	1981	1982	1983
Austria	3135	5003	5982	5770	2705	4145	4469	4772	51421	67840	70900	74231
Bulgaria	573	534	517	518	449	489	553	468	8607	12695	13413	7634
Canada	11481	16862	16402	17456	6898	11262	9817	11081	142573	169198	174961	180780
Czechoslovakia	559	285	305	366	484	373	265	279	14646	14123	13990	13839
Finland	2795	3017	3235	3591	1402	3925	3484	3529	36013	43571	46259	48814
France	28082	33175	33527	36486	16957	32330	35452	32754	402033	314189	327344	335728
German Dem.Rep.	594	382	382	383	624	408	379	344	34655	24054	23385	22653
Germany,Fed.Rep.	17334	20978	20931	22554	12826	14699	15086	15076	277772	286954	287226	285528
Hungary	374	370	412	590	397	358	395	608	8747	9652	9771	10440
Italy	--	14468	--	16627	--	4853	--	1785	--	--	--	--
Japan	155469	134251	139198	150318	109166	68314	86125	113245	689471	819010	841984	883341
Netherlands	--	--	--	332	--	--	--	394	--	--	12654	13048
Poland	1052	697	634	736	873	517	454	575	15658	18788	18945	19217
Sweden	5883	7067	7926	8816	3988	4765	5240	4895	76708	86175	88072	89696
USSR	4066	1823	2483	2384	2676	2530	1934	2094	29348	40563	40907	41315
USA	34573	52509	63745	55545	30931	42702	42444	46752	390213	508132	541642	583458

Source: World Intellectual Property Organization, Geneva.

Appendix 12

PATENTS GRANTED TO EASTERN BLOC COUNTRIES BY INDUSTRIAL WEST, 1970-1982



Source: H. Wienert, J. Slater: East-West Technology Transfer, The Trade and Economic Aspects, OECD, Paris, 1986, p. 124

Appendix 13

Receipts for licenses.
(in millions of US dollar prices from 1970)

Country	1960	1970	1980	1984
Austria	--	8	36	30
CSSR	--	5	4	4
FRG	40	119	612	574
Finland	--	--	4	5
France	48	68	426	
Italy	21	78	808	997
Japan	2	59	351	574
Netherland	--	101	418	300
Norway	--	--	90	29
Sweden	--	15	92	81
U.K.	--	264	1203	1127
USA	650	2203	6976	8128

Royalties for licenses.
(in millions of US dollar prices from 1970)

Country	1960	1970	1980	1984
Austria	--	33	152	108
CSSR	--	24	18	18
FRG	128	344	1445	1138
Finland	--	16	89	103
France	91	221	1028	883
Italy	48	336	1222	1694
Japan	15	433	1328	2276
Netherland	--	115	643	558
Norway	--	--	95	79
Sweden	--	44	225	235
U.K.	--	239	927	828
USA	75	225	768	523

Trade balance in licensing.
(in millions of US dollar prices from 1970)

Country	1960	1970	1980	1984
Austria	---	-25	-116	-78
CSSR	---	-19	-14	-14
FRG	-88	-225	-833	-564
Finland	---	---	-85	-98
France	-43	-153	-532	-457
Italy	-27	-258	-414	-697
Japan	-13	-374	-977	-1589
Netherland	---	-14	-225	-258
Norway	---	---	-5	-50
Sweden	---	-29	-133	-154
U.K.	---	+25	+276	+299
USA	+575	+1978	+6208	+7605

Source: Review of Economic Development in Abroad 1988; Center for Scientific, Technical and Economic Information, Prague 1988

Appendix 14

Import of licenses in three socialist countries.

	1971–1975	1976–1980	1981–1985	1971–1985
CSSR				
Number of licenses	185	291	239	715
Royalties for licenses in Kčs	1406.9	1664.3	1403.8	4475.0
Poland				
Number of licenses	316	136	6	458
Share of capitalist countries in %	90.5	94.1	66.6	91.0
Royalties for licenses in zl	435.0	938.0	7100.0	–
Hungary				
Royalties for licenses in Ft	424.2	3224.1	6400.3	–
Share of capitalist countries in %	91.0	93.3	93.8	93.5

Source: Statistical Yearbooks of the countries referred to.

Appendix 15: A Bibliography

The following bibliography on technology transfer is divided into four groups: general literature, literature on East–West relations, literature by country, and by industry. May it be noted that the current state of knowledge about West–East technology transfer is characterized by

- a comparative abundance of articles and books;
- low accessibility of information from some countries, mainly from the Eastern ones;
- and very uneven professional standards.[11]

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[11]For instance in the introduction to the report *Technology Transfer between East and West*; E. Zalenski (ed.), OECD, Paris, 1980, it is complained that "an equivalent standard as in the USA is to be found in only a few West and European countries (notably in the United Kingdom, Germany and France)." Another publication, this time from the USA, declares the "rich" literature on this topic as "unsystematized." (G.K. Gertsch, J.R. McIntyre (ed.): *National Security and Technology Transfer. The Strategic Dimension of East-West Trade*; in the preface).

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Appendix 16: Case Studies

Furnel: A Polish Case Study

The case study of Furnel International Limited provides us with insight into the motivation behind a joint venture partnership that attempted on the one hand, to achieve an important technology, and on the other, to surmount the hurdles of the currency crunch and succeed in business. The name "Furnel" is an acronym for "furniture" and 'electronics." In simplified terms, it is a joint venture that exchanges Polish furniture for British electronic equipment.

Furnel is by far the largest industrial joint venture in Poland. Established in 1986, it now employs some 4,500 people. It is credited with approximately 10% of the Polish furniture industry and accounts for some 75% of all Polish joint venture exports: five times as much as the next joint venture exporter.

Furnel's British partner is International Computer Limited (ICL), which is a part of British Standard Telephones and Cables (BTC). Having been involved in the Polish market for more than 25 years, ICL had acquired extensive experience not only in product marketing and assembly with Polish manpower but also in various forms of countertrade. Thus they were able to assess the benefits and risks of the joint venture and its possible role as a bridge for future market expansion.

BTC-ICL contributed to the joint business a 35% capital share amounting to approximately 2 mio$ However, as BTC-ICL's world-wide sales exceed 3 bio$, the risk involved with the Polish venture was very commensurate.

On the Polish side, the foreign trade company PAGED, which specializes in furniture exports, formed a consortium of six firms involved in wood processing and furniture manufacturing. The Polish group represented a vertical integration with 80% self-sufficiency from raw materials to final products. This is an advantage in Poland, where supply disruptions are a chronic problem.

Two electronic firms, Mera and Metronex, were also members of the Polish group and accounted for 16% of the invested capital, mainly as an in-kind contribution. Mera is expanding on the Polish market and Metronex is its foreign trade partner.

The Polish wood and furniture industry is recognized for its design and has proved competitive on several markets. However, the Polish producers were aware of desirable improvements in manufacturing methods and quality guarantees. An evaluation of the products revealed that a comparatively small capital investment into manufacturing modernization could elevate the products to a world standard level.

The Polish partner group brought in 49% of the statutory capital, mainly in-kind, i.e., buildings and equipment. The British partner was relied on as a source of hard currency for technological modernization.

The main problem to be circumvented by the joint venture was the convertibility bias. The Polish zloty was not only nonconvertible but, at the same time, burdened with inflation. A countertrade arrangement seemed to be the only feasible interlink; it proved effective.

ICL could now enjoy a competitive edge over its computer trading rivals by selling to the Polish market for zloty instead of hard currency and could provide software and consulting services on a similar basis. Its hard currency profits would come from sales of the joint venture's furniture abroad.

Using its equipment and know-how contribution, ICL planned to begin manufacturing in Poland together with Mera. In the early phases, the production was to use licensed ICL technology and imported components and sub-assemblies. Furnel hoped to increasingly develop and produce the products in Poland, first for the domestic market and then, perhaps, for export in the CMEA region.

The joint venture started operating in February, 1988, in which year, according to Furnel sources, its hard currency exports amounted to more than 12 mio.$ and furniture exports were up 8% from pre-joint venture levels. It was predicted that future exports would rise by 400%.

The technology transfer involved a twin effect. The joint venture arrangement enabled the furniture manufacturing plants to import badly needed advanced machinery. At the same time, the participating electronic firms adopted ICL technology and assembly know-how. They came close to world technology level and enhanced their industrial image.

The British partner was able to expand the production scale and increase sales and profits. In future years, BTC-ICL should be able to expand not only on Polish markets but also in those of other CMEA member countries.

To a large extent, Furnel owes its success to the use of advanced management techniques, some of which were part of ICL's know-how contribution. The workers, numbering over 4000, split their earnings from finished products on a piece-work and commission basis. This is said to have improved quality and decreased absenteeism by 50%. The company tries to keep wages for joint venture workers 30% above wages earned by those outside the venture but maintaining this is made difficult by Poland's wage-price inflation. Furnel's future plans include the implementation of more Western management techniques and, possibly, the start of a Furnel International Business School using ICL's experience in management development and business training.

Higher technology, better management skills, employee training, and motivation were associated with this exceptional joint venture, which was concluded under rather unfavorable circumstances. If the partners were not inventive enough, the complex case might fail.

Admittedly, Furnel's management has been creative in several aspects. Basically, however, the joint venture was an attempt to succeed in business against such odds as credits not being available and zloty being nonconvertible. It can be better described as an institutionalized barter trade. Had the Polish wood and furniture conglomerate been able to obtain hard currency financing to fund improvements from some other source, they would not have needed a joint venture. Likewise, had zloty been convertible, ICL would not have had to join the furniture companies in order to have exportable profits.

AVEX: A Czechoslovak Case Study

Avex is the logo for a Dutch-Czechoslovak joint stock company for development, manufacturing, marketplace studies, and sales of consumer electronics. It is located in Bratislava (the capital of Slovakia).

Its partners are TESLA Entertainment Electronics, Bratislava (70%), PHILIPS Gloeilampenfabrieken N.V., Eidhoven (20%) and Transakta, Prague foreign trade representation (10%). Other capital was backed by bank credits, in particular by the Zentralbank A.G. (Vienna). The joint business was registered in August 1987 (under former legal provisions on joint ventures[12]). Manufacturing activities began in November 1988 after production and auxiliary facilities had been rebuilt and expanded.

The capital invested by PHILIPS Gloeilampenfabrieken N.V. was contributed mainly in-kind. At the time of the technology change at Eidhoven, the Dutch firm was about to buy new Japanese technology and transfer its present technology to the plant in Bratislava. (At that time, the transferred technology was still comparable to most West European plants in consumer electronics and unique in East European countries.)

The management of the new joint venture bought a garment and underwear factory which was reconstructed, modernized, and expanded. The building facilities were adjusted to the new flow of manufacturing demands for transport and storage, administration and technical services: the production area now covers approximately 6,000 m^2; the automated assembly of microprocessor plates for videorecorders operates in the field of 1 micron resolution; the production line is terminated by automated testing equipment; and the whole process is supported by an integrated computer control.

The retraining of manpower proved to be rather easy. The women employees, who had previously sewn underwear and garments, were able to acquire new skills in a comparatively short time. After manufacturing commenced, PHILIPS continued to supervise the process for 3–4 months, after which time it recalled its production inspectors, as products were already reliably meeting PHILIPS quality standards.

However, several problems persist. It is crucial for an automated assembly to develop advanced logistics. Some subcontractors are not motivated to supply parts that meet high international standards. AVEX has to buy such parts in the West. The fulfillment of production capacity (some 200,000 videos/year) depends on sales of products abroad in order to procure the necessary assembly parts. An eccentric circulation has developed: sales and purchases are effectuated more outside than inside the domestic marketplace.

AVEX is now looking for standing subcontractors on a trading basis. It was proven that permanent contact with part suppliers and joint innovation effort are vital for the continuity of the process and quality of the products.

Both managements, at Eidhoven and in Bratislava, are quite satisfied with the results achieved so far and are considering expanding the joint venture in the foreseeable future.

[12]Legislation amended substantially since 1989

McDonald's in Moscow: A Soviet Case Study

McDonald's franchises constitute a chain of approximately 11,000 fast food restaurants throughout the world with sales of more than 8 bio$ and profits close to 340 mio$. Recently, McDonald's negotiated its first Soviet affiliation in Moscow.

The contract on the biggest joint food business venture so far was signed in 1988 between the Canadian McDonald's and the Directorate of the Moscow Restaurants Company. A vested capital of 22 mio $ was contributed by the Soviet partner, i.e., 51%, and 49% by McDonald's Canada. A sizable part of the Canadian share was settled in-kind (equipment, know-how, and consulting).

McDonald's Moscow is an exact replica of its world counterparts, apart from size—it is by far the largest. It has 800 seats, some 30 cash registers, and its 400 employees (27,000 applications were received) serve approximately 15,000 customers per day. The price of a hamburger is 3 rubles, for which a 3–4 course lunch could be bought in any reputable Moscow restaurant.

The technology transfer associated with the McDonald's franchise was effectuated by the western partners' insistence on a strict adherence to all current principles, rules, and codes of conduct practiced by McDonald's on a worldwide scale.

Western managers, consultants, and trainers guarantee that the exacting standards set by McDonald's will be met. Food is served in the same wrapper as elsewhere in the world. A customer entering McDonald's Moscow must receive a level of service comparable to that of any McDonald's in the West. In-company supervision and inspection is as responsible and rigid as at any affiliation abroad.

McDonald's envisages establishing some 20 similar fast-food restaurants in Moscow and other Soviet cities. A factory compound covering 10,000 m^2 of production surface and built for approximately 25 bio $ will employ 200 Soviet workers and will deliver 55 t veal, 36 t potatoes, 90,000 l milk, etc., per week.

The Moscow affiliation commenced operations in February 1990. Called "beeg mek" (big Mac), the restaurant on Pushkin Square is enjoying an incomparable boom.

Textile Manufacturing Transfer: A Hungarian Case Study

The KBC Budapest joint venture between a leading German textile corporation and 40 Hungarian shareholders (with an investment ratio of 50:50) was signed in July 1988. One year later, a new factory had already been built, and by November 1989, was operating on a 3-shift basis.

The production program consists of textile printing (on viscose and cotton). A new factory (9800m^2) with a presently planned capacity of 8 million meters/year of material (later 12 million meters) or DM 60 (later 80) million/year supplies the Hungarian (and other Eastern markets) with its products. Profits are taxed at 20% (an unexpected setback: initially 5 years of tax exemption had been promised). The estimated payback period for the capital invested (some DM 40 million) is 8–10 years.

The factory is a copy of the German founding company. All the machinery is German. The material (in its raw state) is also German, although it is presumed that in the foreseeable future, a Hungarian supplier may be found who can provide material that conforms with the prevailing quality standards. Colors and other additives are likewise of German origin.

The construction workers, most of whom are from the Eastern regions of the country and who were attracted by the investment boom, are relatively unskilled. On the other hand, the shop workers are fully comparable "if not better than those in Germany as far as their skills are concerned." However, they lack a high work morale and are not "cost-minded." The workers are paid an average of Ft. 20,000/month, which, while above the Hungarian average, is equivalent to only about DM 630 or US$ 340 per month. The management staff are "pretty good but not accustomed to taking responsibility and working fast." Permanent cost-benefit evaluation is "something new to them." KBC Budapest delivers mainly viscose tissues. Around 300 designs are deliverable in 3,000 variations. The production volume is approaching some 60 mio DM (three times the capital invested).

It was expected that the joint business would use more domestic raw materials. However, the demanding technology needs a certain amount of time until domestic suppliers can adjust.

KBC Budapest was a quickly accomplished technology transfer which made it possible to offer on the market an advanced and fashionable product. It is possible to expand deliveries to other CMEA country markets.

Sancella Hungary: A Hungarian Case Study

Sancella Hungary is a technologically advanced Swedish-Hungarian joint venture that manufactures hygienic baby napkins and baby diapers ("hygienic tissues"). The Hungarotex Foreign Trade Co. began business relations with the Swedish Mölnlycke AB Group in the early 1980s. Growing trade between them gradually fostered mutual understanding and trust. The idea of converting the trade cooperation into a joint venture came from the two sides almost simultaneously.

The Mölnlycke Group has now established joint ventures in 9 countries in Europe and overseas. Another joint venture in Hungary could strengthen the company's endeavors, and guarantee them a leading position on the world market.

The first steps, however, had led to a certain disillusionment: the consensus of both initial parties was not at first backed by Hungarian industrial and banking firms. But confidence returned after Hungarotex had visited Interinvest, a small but agile bank, and the Ministry of Finance had confirmed their positive attitude toward foreign investment in the country. After that, establishment of the joint venture began to proceed:

- Birth of the idea, early 1984
- Search for partners, Summer 1984
- Feasibility study, September 1984
- Signing of the agreement, May 1985
- Renovation and expansion of factory and administrative facilities, May 1985
- Approval by the authorities, September 1985
- Recruitment of employees and testing of sales, September–November 1985
- Delivery of machinery, December 1985–January 1986
- Pilot production, February 1986.
- Three-shift production, September 1986.

The timetable discloses that the build-up of the manufacturing facilities started before official approval. Full operation of the factory at Nagykata (some 65 km eastwards of Budapest) was attained in one year's time.

Sancella Hungary began operation with a capital stock of 100 mio Ft, of which 49% came from the Swedish partner, a further 34% was invested by Hungarotex, and the rest was deposited by Interinvest.

The Swedish contribution was carried out in kind: machinery and mostly know-how (45 mio Ft) and only a small part (4 mio Ft to cover custom duties) in cash. The Hungarian-Swedish company soon had to raise credits as a consequence of the fast growth of production.

Up-to-date technology (hardware and know-how) was provided by the Swedish partner. Two highly productive machine systems made it possible to raise output to some 1 bio Ft, of which 200 mio Ft (20%) was profit. (A shortcoming was that the hard currency balance had been negative until 1989, since which time it has regained equilibrium.) The joint venture business is tax-exempt for the first 5 years.

The owners share profits according to their capital contribution. The Swedish partner is entitled to take home its proportion of profit in hard currency. However, they have decided to reinvest most of it and put off withdrawing profits until after the business has reached full expansion and stability.

Full technology transfer was assured by transplanting the entire line of equipment from the Swedish plant to the Hungarian affiliation. The bilateral contract guarantees that in case of possible termination of the cooperation, the Swedish partner's confidential know-how will be protected against infringement from outside parties.

All manufacturing procedures at Sancella Hungary closely follow Swedish standards. From time to time, Swedish inspectors check production discipline. Product quality is excellent.

The hygienic character of the products puts high demands on packaging material. It took half a year to develop and begin manufacture of adequate packaging.

In order for joint manufacturing to be a success, not only physical but also managerial infrastructure is an important prerequisite. The management system worked out by the Swedish and Hungarian founders called for the firm to be led by a Hungarian acting manager to whom the heads of marketing, manufacture, and finance are subordinate (75 staff members in total).

Manual worker were selected mainly from local inhabitants. There were several applicants for each available job. The average wage is 90,000–100,000 Ft per annum, about 50% higher than in most Hungarian plants. Performance, quality, and efficiency are also higher.

An intricate problem was harmonization of accountancy. The Hungarians, for instance, saw a cause for concern in the valorization of intellectual property. After some deliberation, the accountancy was adjusted.

The marketing strategy is based on a comprehensive system of reeducation and information. Disposable products had previously accounted for less than 10% of the Hungarian market, and thus a guiding campaign for the new products had to be launched.

Although it was primarily the high quality of its products that allowed Sancella Hungary to expand, attractive marketing was also extremely helpful. The firm's television commercial was praised as being the best on the air.

Recently an American company with wide experience and powerful capital resources has decided to compete with Sancella on the Hungarian market. Both competitors have analyzed the market's capacity and have decided to compete for its enlargement.

Italian Chemical Manufacturing in the USSR and Hungary: Soviet and Hungarian Case Studies

Italian Snamprogetti s.p.a. has furthered the improvement of several industrial chemical processes which they are looking to commercialize in Central and Eastern Europe. The following case studies interpreting Snamprogetti's technology transfer and marketing methods allow us to compare two approaches to a similar problem.

The Soviet Variant

In the early 1980s Snamprogetti s.p.a. finalized details of an alliance with the Ministry for Petrochemistry of the USSR (Minnefteprom) and the Nauchno-Issledovatelskiy Institute Monomerov dlya Sinteticheskogo Kauchuka USSR (NIIMSK) on the Dehydrogenation Technology of Isobutane to Isobutene.

Although several dehydrogenation plants were already in operation in the Soviet Union and nearby countries, both Snamprogetti and the Soviet parties were aware that for wider commercialization some targeted improvements were necessary.

The increasing utilization of MTBE in the gasoline pool would have required an alternative production manufacturing process and the hydrogenation of Isobutane was the only possible Isobutene source for a large plant.

In June 1981, Snamprogetti s.p.a. concluded a Cooperation Agreement with V.O. Licensintorg, the Soviet foreign trade licensing company. The aim of the agreement was the exchange of scientific and professional information, the evaluation of process and equipment design options, and the improvement of catalyst formulation and industrial manufacture procedures. It was finalized by a feasibility study on innovations carried out at a Russian pilot plant and by the joint development of an improved scheme of the industrial process.

As a result of this international cooperation, Snamprogetti was given the exclusive rights to market the improved technology and know-how in Western countries.

The results were so encouraging that both partners concluded an expansion of the agreement. In 1985–1987 additional laboratory tests were made at the Russian pilot plant in the presence of Italian exporters. First of all, the intensity and endurance of the catalyst were checked, and at the same time, optimization of the process was studied. Based on carefully screened results, patents were filed.

Snamprogetti technicians were present during the above tests and examined the operation of the industrial dehydrogenation plant (designed and operated under the base process) in Togliatti (USSR), in order to verify all operative data.

The laboratory studies continued with the development of a catalyst for the propane dehydrogenation.

The affiliation between the Soviet and Italian parties proved to be so friendly and successful that in October, 1989, they signed a new agreement to study the dehydrogenation of other paraffinic hydrocarbons. The new cooperation foresees a) the study of catalytic systems which have a chemical composition similar to the one already optimized for isobutane dehydrogenation and b) the study of completely new catalytic systems with a different chemical composition.

Laboratory tests have been completed and the new catalyst will be tested at a Jaroslavl (USSR) pilot plant.

The partners are about to establish a joint venture for the industrial production of the catalyst and to build a demonstration semi-industrial plant for propane dehydrogenation. The main advantage of the dehydrogenation process jointly developed by the Soviet and Italian parties is the catalytic fluidized bed. The process scheme is very simple and therefore investment expenditures have been heavily reduced in comparison to competitive processes. The improved manufacturing has been identified as the NIIMSK-Snamprogetti Isobutane Dehydrogenation Process.

Snamprogetti is confident that the next Soviet-Italian joint venture, Ecolita, will be the first in the world to operate using innovated methods and technology on a large scale industrial basis.

The Hungarian Variant

In 1980 Snamprogetti s.p.a. granted to the Hungarian Foreign Trade Organization Chemokomplex the licensing rights for a chemical plant to be built by Tiszai Koolajipari Vallalat (TIFO) at Leninvaros, in accordance with the Italian firm's Ecofuel MTBE Technology. This plant, with a capacity of 30,000 MTPY, was the first in the world to produce MTBE through steam cracking before butadiene extraction and went successfully into operation in 1982 (after overcoming problems caused by the high butadiene content and its possibly spontaneous polymerization).

The alliance between Snamprogetti and the Hungarian Partners was so satisfactory that in 1982 Chemokomplex-TIFO and Snamprogetti agreed to extend their cooperation and build a demonstrative (Reference) plant for the manufacture of high purity isobutane via MTBE cracking based on the innovated Snamprogetti technology.

In order to facilitate the implementation of the plant, Snamprogetti supplied, on a free of charge basis, the license, design, engineering and part of the equipment. TIFO provided plant sites, utilities, and some equipment, supervised the construction of the Plant, and took over its operation.

As scheduled, the Leninvaros Demonstration Plant commenced operation in late 1987, and was the first in the world to produce Isobutene via MTBE Cracking.

The performance standards were not only met but largely exceeded. In particular, the results of the purity of the isobutene produced was more than 99.99%, making it the most pure isobutene available, suitable not only for polymerization but also for pharmaceutical purposes.

The cooperation of the two parties extended beyond the test-run of the plant. Snamprogetti and TIFO increased the capacity of the demonstration unit from the initial 500 MTPY up to the present 3,200 MTPY.

Snamprogetti and TIFO will probably go ahead with the implementation of a new, larger isobutene plant under Snamprogetti license and could extend to the development of other technologies.

In the meantime, at Snamprogetti's request, TIFO will provide technical assistance during the initial stage and testing period of other Snamprogetti isobutene licensees and will perform jointly with Snamprogetti in training licensees at its Leninvaros facilities.

Advanced features of the innovated manufacturing process are contingent mainly on the use of a new breed of highly selective and active catalysts. The MTBE is separated from effluent gaseous hydrocarbon and then purified in order to remove light and heavy by-products. Purified MTBE enters the decomposition reactor where it is decomposed into isobutene and methanol. High purity isobutene is recovered.

One of the main advantages is the absence of environment polluting substrates and emissions associated with conventional methods using sulphuric acid.

This Italian-Hungarian industrial cooperation led to the development of a world leading chemical manufacturing innovation and promoted both participating firms to world industrial eminence.

The Long-Range Industrial Agreement FIAT–VAZ: A Soviet Case Study

In the period 1966–1972, FIAT s.p.a., the Italian leader in car production, concluded a rather comprehensive agreement on industrial cooperation with a new car production compound, Volzhskiye Avtomobilniye Zavody (VAZ) in the USSR.

FIAT was asked to provide a project of plants capable of manufacturing 600,000 cars per year (with related repasses and repairs).

Technical documentation for two basic models was derived from the current models FIAT 124 and FIAT 125. The design was adjusted to the specific transport conditions and market demands of the country.

The object of the technology transfer was the production of design and manufacturing methods; the know-how for the operation of a large car producing system; the training of personnel from top managers to shop operators, and the organization of post-sales services.

The general agreement was signed in May 1966 and a detailed contract followed in March 1967. The production of the first model, a clone of FIAT 124, started in 1970, and the second based on FIAT 125 in 1972.

Prior to the agreement, FIAT's production constituted 1,150,100 cars/year. Its still-free production capacity was estimated at 300,000 cars/year. In 1972, the expanded production in Togliatti (the town was so-named in order to honor the Italian/Soviet cooperation) achieved 600,000 cars/year.

The industrial cooperation between FIAT and VAZ is often exemplified as an effective technology transfer. First, the models offered were meticulously redesigned to meet the specific needs of the contractor, while a sizeable part of the usual design cost was saved; second, the manufacturing methods were prepared and tested in Italy and then transferred to the USSR, and a technology development and training center was established so that the Soviet partner obtained a professional background for further creative activity and growing self-reliance.

How does FIAT assess its gains from the international cooperation? The firm became international in the perspective area of the USSR and other CMEA countries; it acquired new experience in "ad hoc technical and organization development"; it was able to prepare managerial and engineering personnel for engagements abroad (some experience would be applied to plant design and operation in Brazil).

The Soviet estimates prefer the fast operation of the new plants; the models manufactured with Italian assistance are in demand not only in the USSR but in most CMEA countries and have found their way to some Western markets; managers, engineers, and workers from VAZ may be found in many other factories in the country.

The increased production of the VAZ car contributed to a sharp growth of the "inhabitants/car" indicator. In 1964 this stood at 250 inhabitants/car; in 1989 the corresponding figure was 20.

Not everything ran smoothly and some impacts were not envisaged. From the point of view of FIAT, the contractual cooperation blocked some human resources (on the management level as well as on the engineering and shop floor level) beyond what had been planned. As a consequence, the redeployment of new models at Turin was obstructed and delayed. Also, FIAT was annoyed by an error which changed the car name from FIAT to LADA.

In addition, FIAT criticizes the fact that a) VAZ did not increase its production capacity and admitted to a large unsatisfied demand and b) in the course of 20 years VAZ had not developed more than two new models (NIVA and SAMARA). What was missing were entrepreneurial managers and central capital investment.