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14996

Distr.
LIMITED

ID/WG.450/5
16 October 1985

ENGLISH

United Nations Industrial Development Organization

Round Table Discussion of an
Advisory Group of INTIB Users

Vienna, Austria, 23-27 September 1985

TOWARDS A EUROPEAN INFRASTRUCTURE FOR TECHNOLOGY TRANSFER*

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V.85-32213

This document describes the background and a follow-up pilot scheme of a study entitled "European Infrastructure for Technology Transfer" financed by the Commission of the European Communities and carried out by the Danish Invention Centre, Technological Institute. The parts of the report to the Commission, dated October 1983, that are relevant to the meeting (Chapters 1, 2, 3, 5 and 6) are highlighted. (See CRP.1 for details of chapters cited.)

CONTENTS

The importance of a flexible infrastructure for moving immaterial know-how on new technology and new markets within a nation has in recent years become more and more acknowledged in most industrialized nations who want to stay ahead in a world of technological and social changes. The EEC has from a strategic point of view focused on the existing infrastructure in the EEC for technology transfer.

This report is part of these endeavours of the EEC. The report shows that Europe is lagging behind in the expanding market of technology transfer, but it also points out that an embryo for a network for technology transfer in Europe does exist, and that the EEC with the use of moderate resources could greatly enhance the effectivity of this embryonic network.

CHAPTER 1

Towards a European Network for Technology Transfer

The market for technology transfer

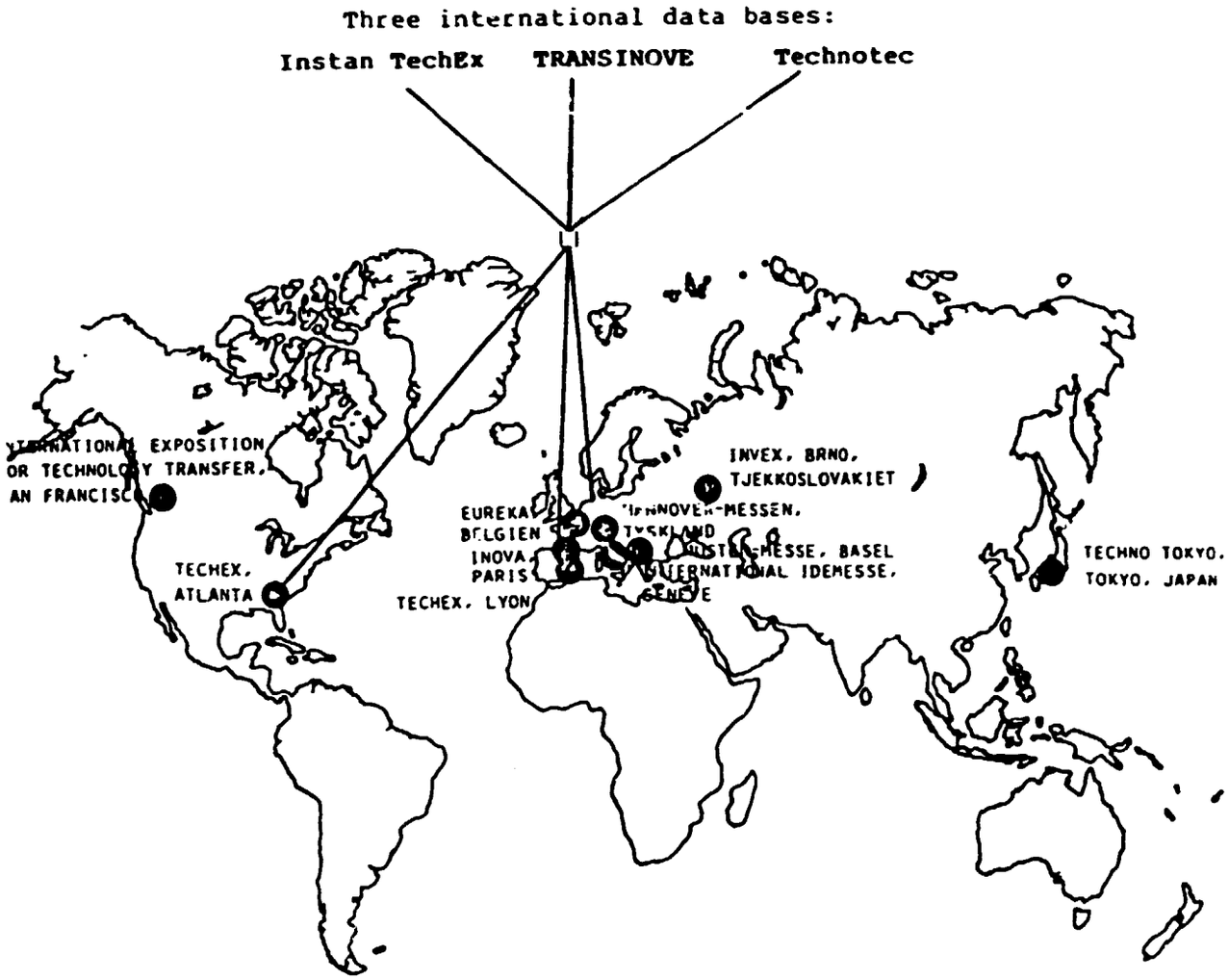
In the 1960s and early 1970s licensing was an activity mainly performed by a few big companies and development organizations. The market was of a very closed nature and mainly built on personal connections.

Within the last decade this situation has completely changed, with the result that we can today speak of an open and huge international market for buying and selling of know-how, licences, patent rights etc. or in short, technology transfer.

It is important to note that technology transfer in this definition does not imply the mere exchange of research results as those known from the scientific literature. Technology transfer means to introduce into practical production the fruits of research, or to use another picture, the technology transfer process can be compared with the process performed by real estate brokers; they are buying and selling real estate but not literature to construct new houses.

The abovementioned expansion and the opening up of the international market for technology transfer can be ascribed to newcomers in the field, *e.g.* universities, small and medium-sized companies and smaller research facilities. An especially interesting group of newcomers in the field are companies who are openly searching for specific new products. This approach was almost unthinkable only five years ago.

A bird's view of the open international market for technology transfer is shown in figure 1.



The international license market

Figure 1 illustrates the international exhibitions in different countries for the purpose of technology transfer, as well as the 3 major data banks for licensing, being the two American ones: Dvorkovitz Instan TechEx and Control Data Corporation's TECHNOTEC, and their European counterpart TRANSINOVE INTERNATIONAL.

Taking the content of the data banks and items shown each year on the different international exhibitions, it can be assumed that the volume of the license offers and quests for licenses is not less than 100,000 items. The exact figures for the total global market for licensing - which could be calculated as the total sum of royalty receipts and royalty payments by the nations involved - are very hard to get at. A conservative estimate based on American, Japanese and European statistics, (Encl.A of CRP 1) gives an annual figure of at least (1978) 35,000 million D-marks, noting that this figure includes both royalty payments and royalty income.

The growth of the market

To measure the growth of the market for technology transfer several indicators can be used, for instance: - the increase in the total royalty payments per year (royalties received and paid), - the patent activity, - membership of different organizations active in the process of technology transfer, R&D expenses etc.

In this study the statistics concerning the total royalties will be used as an indicator of the technology transfer activity (cf. enclosure A of CRP).

Figure 2. Growth rate
Technology transfer

	1976 - 81	1980 - 81
Japan	20.4%	62.4%
USA	9.4%	31.5%
EEC*	12.6%	18.3%

* As figures for 1981 were not available for Belgium, Luxembourg and the Netherlands these three countries are not included in the growth rate calculation at all.

Market shares

A very rough calculation based on the figures in Encl.A of CRP.1 gives the market shares between Europe, Japan and U.S.A., as illustrated in figure 3.

Figure 3.

	1972	1978	*) 1980	1981
Japan	7.8%	8.1%	8.9%	11.5%
U.S.A.	38.9%	36.3%	39.9%	41.5%
EEC	36.5%	33.9%	51.2%	47.0%
Others	16.8%	21.7%		
	100.0%	100.0%	100.0%	100.0%

*) The figures for 1981 for Belgium, Luxembourg and the Netherlands are estimated on the basis of the 1980 figures, and the group "Others" has been left out in this connection, as Switzerland, due to its unique position, is not included in the latest statistic material, (see Encl.A of CRP 1).

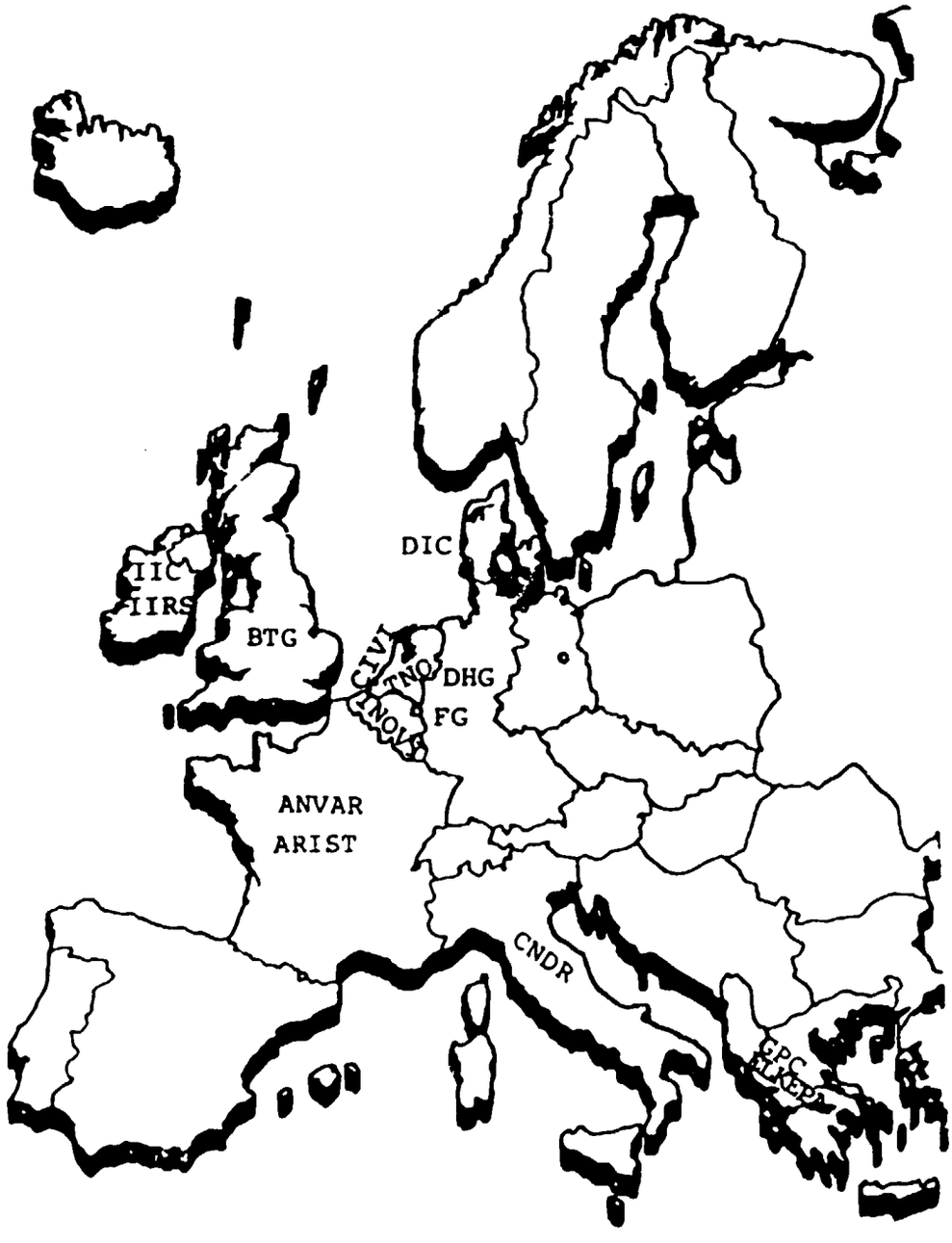
The main conclusions to draw from these introductory remarks are that technology transfer is a huge market, it is growing fast and Europe is lagging behind.

It has to be borne in mind that the statistic material is very different in nature. Some countries include copy right fees, management fees, film business etc. In the same connection it also has to be mentioned that Switzerland has a very dominating position, and it is difficult to judge to what extent EEC countries (for instance through holding companies) are represented in the Swiss material - however, anticipating that the different national statistics have been made in a consistent manner during the years 1972-81 it is relatively safe to draw conclusions with respect to market growth rates and market shares.

National and regional organizations for technology transfer

The strategic importance of the process of technology transfer was soon recognized by most of the European countries, and all European common market countries have organizations, which are active in this process. Most nations have both national centralized organizations and regional organizations. Said organizations can be governmental, public, semi-public or private. (See CRP 1 for brief description of the set-up in each of the EEC member countries).

In the following illustration the different organizations mentioned above are placed geographically on a map.



Chapter 2

Typical activity pattern for national TT centres

Taking into consideration the differences between the EEC countries with respect to industrial structure, culture, size etc., the work of the different TT centres is very much alike. This is due to the fact that every new industrial idea/concept has to pass through the same sequence of operations: "evaluation, research, patenting, negotiations, contracting, etc." This sequence is known as the innovation chain and is in a very short version illustrated in figure 4 below.

The innovation chain **Figure 4.**

Need
Brainstorming
Ideas
Concretizing
Idea
Patent application for the idea
Preliminary technical evaluation
Preliminary market analysis
Literature and novelty search
Preliminary technical/economic calculation
Experiments in laboratory
Pilot plant experiments
Patent application for a product
Feasibility study
Production layout
Technical/economic calculations
Preseries production
Market analysis
Financing
Planning of factory
Launching of production
License contract
License manufacturers
Know-how exchange

Not every project idea has to pass the whole innovation chain, short cuts can be made, and in this connection it can be added that not every European TT centre has - today -activities which cover the whole spectrum of the innovation chain. Since Denmark is a small country, The Danish Invention Center (DIC) has to cover most of the innovation chain, and in the following the working process of the Danish TT centre will hence be described.

Typical national TT centre procedure - Denmark as example

In short the aim of a TT-centre is to establish as many successful contacts (i.e. new production) as possible between those who seek new valuable product ideas - the industrial sector - and those offering new ideas: university researchers, private inventors, small companies, etc. The DIC hence had to develop the following functions:

A. Idea searching/advisory service.
B. Innovation section:
   Prototype workshop/financing of development.
C. Licensing/contacts with industry.

Chapter 3

Existing process for transnational technology transfer in the EEC as performed by experienced TT agents

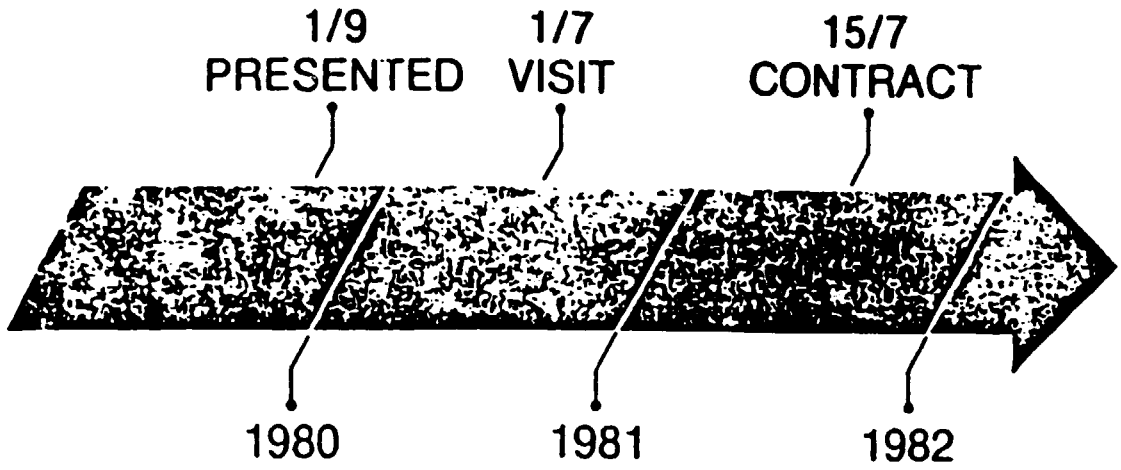
The drawbacks of the system

As mentioned in chapter 2 most national TT centres have adopted more or less the same activities, i.e. activities linked to the innovation chain. In recent years some of the national TT centres have tried to find licensees abroad in the EEC, while some of the TT centres through national technology import programmes have been searching for new technologies abroad in the EEC countries on behalf of their industrial clients.

Two different ways of cooperation between national TT centres in Europe have taken place. Typically, national TT centres have exposed their license offers on international know-how exhibitions, have filed their license offers in data banks or have issued newsletters (as for instance even the EEC itself).

TT centres looking for new products on behalf of their clients have picked up these offers, and in many cases cooperation has been established in this way.

A more active approach is being followed by those TT centres searching for new products on behalf of their industrial clients. These TT centres often forward letters to other European TT centres containing specifications of the search profile of the company and the nature of the company in question, and in these letters the other TT centres are asked to forward license offers which suit the described search profiles. In the following a typical case of such a cooperation is illustrated in figure 5.



In September 1980 the DIC was searching on behalf of its client (a subsidiary of one of the largest Danish industrial complexes) in the TRANSINOVE data bank.

One of the items identified through the search procedure was a new power tool, which could be utilized by the building industry. The company immediately took an interest to this item. The item in question was invented in a Mideuropean country, and the inventor had assigned part of his right to a national organization for research promotion. This national organization was asked for further information requested by the interested Danish company. Howeve., letters and telex were unanswered for several months.
The DIC, who had good relations with the abovementioned national organization, finally arranged a meeting (the journey was paid by the technology import programme of the DIC) with this organization between the inventor and the Danish industrialist.

Before the meeting the Danish company obtained further information and during the meeting prototypes etc. were presented, and an agreement was reached between the inventor and the Danish company. Or, more specifically, the agreement was made between the licensee of the inventor and the Danish company, and the licensee granted the rights to Scandinavia and Great Britain to the Danish company, but not the rights to Denmark.

These rights were to be settled with the abovementioned national organization. After some further complications the final contract was made, almost 2 years after the company had evaluated and chosen that specific project. This example is by no means outstanding. It is in fact very typical. Some conclusions could be drawn:

1. The communication of technical information needed for industry to make a decision on whether or not to visit a potential licensor takes too long.

2. Industrialists need tangible facts, photos, prototypes, test reports.

3. Not all TT centres have a licensing facility with sufficient autonomy, and especially not a licensing facility to deal with foreign contacts, not to speak of contacts with other EEC countries.

4. The problem was finally settled because the Danish TT centre and the licensor's TT centre had good personal relations, and because the DIC had the means to pay for meeting costs etc.

5. The whole process was a success because an industrial client wanted the product. The industrialist and the Danish TT centre were the driving force.

In this connection it has to be mentioned that an informal network, the so-called NRDO type of organization (i.e. National Research Development Organization) does exist. This organization counts among its members: ANVAR, NRDC, Frauenhofer Gesellschaft, Battelle Research Cooperation, The Danish Invention Center, NOVEX, STU, etc. Very good personal relations do exist in this personal network and are very often used to check the specific nature of a potential licensee or licensor, but a formalized and dedicated work to form intereuropean licensing is virtually non-existent.

It is the experience of the DIC that private mediators, brokers who have industrial clients, are much more active partners than the existing public and semi-public national TT centres.

As a conclusion it could be said that many public and semi-public national TT centres do not have the set-up or the incentives to perform intereuropean licensing. This is truly a pity seeing that most innovation and new products originate from these very sources.

This fact is even more regrettable as Europe has considerable advantages with respect to technology transfer, as it will be outlined below.

There are between the European countries large differences in the industrial infrastructure. This implies that an invention made in one European country may not have a national license possibility simply because the industry in question does not exist in that country. In many cases such an invention is lost or a license is granted to someone outside Europe.

With a smoothly running network for technology transfer in Europe most inventions could be kept for European industries, as these large differences in industrial structure could be bridged by such a network. To illustrate by a somewhat hypothetical example: a Danish inventor who invents equipment for the wine industry would certainly have very few possibilities of finding licensees in Denmark. His chances in Italy and France would be much better.

Summing up it could be said that the process of technology transfer in Europe is not systematized, even though national technology transfer centres do exist and perform technology transfer activities. The main reasons for this lack of inter-european technology transfer are:

A. Lack of knowledge of who is active in the field.

B. Lack of adequate communication system.

C. Lack of incentives to perform intereuropean licensing.

In this connection it has to be mentioned that a lot of practical barriers exist in Europe, linguistic problems, different national regulations, cultural differences, etc.etc. In Scandinavia these barriers, as outlined above, do not exist or at least have very little significance, and in Scandinavia TT centres of the same nature have been existing in each country for more than 10 years. One should therefore think that with none of the barriers mentioned above and TT centres performing more or less the same activities, there would be a very active interscandinavian licensing. In chapter 4 the Scandinavian activity in this field will be described more in detail.

Chapter 5

The ideal system

Before going on to discuss the ideal system let us sum up all the drawbacks of the existing situation as outlined earlier:

1. Lack of a fast communication system where photos and drawings can be exchanged.

2. Lack of centres covering the whole innovation chain service (particularly technology transfer centres with industrial contacts).

3. Lack of knowledge of centres which perform technology transfer.

4. Lack of an overall view as to what is available in the different TT centres.

5. Lack of resources and incentives for intereuropean technology transfer.

6. Cultural and linguistic barriers.

Ad 1: We are living in a society where visual communication is extremely important. The decision-makers in industry are accustomed to base their visions on tangible matters, prototypes, functional models, mock-ups etc. Unfortunately, it is not feasible to forward prototypes to all interested parties. The next best solution is to forward photos and drawings. If this is done in a convincing manner the first crucial decision of whether to travel and meet with the licensor can be made. The communication system is also of great importance in the initial phases of the technology transfer process because it enables the TT centres during a license negotiation to supply further information required very quickly.

Ad 2

In order to be able to cooperate it is essential that the different national TT centres have more or less the same structure and thus, so to say, speak the same language. Of particular importance is the desirability of the TT centres to have a very close daily contact with that part of industry which is actively seeking new production possibilities. Preferably TT centres should have search profiles of several of these industrial clients. It has to be borne in mind that the driving force - and also the bottleneck - is that relatively small number of advanced and dynamic companies which are really looking for new products.

Ad 3

This lack of knowledge is, of course, a major drawback, but the situation has already improved a good deal, chiefly due to the efforts made in connection with the EEC seminars, ad hoc working groups etc. Also, this point is crucial as technology transfer is a very personal process, which can only be performed successfully when complete confidence in persons exists.

Ad 4

Only a modest fraction of what is available of new technology and industrial requests for technology in the different national TT centres is publicly available. Quite obviously this limits to a great extent the possibilities of matching supply and demand for new industrial opportunities. One of the main reasons for this is that it is very expensive to bring up every license offer to a stage where it is fully documented, and where it can be publicly displayed. This means that for each license offer publicly displayed there might be 10 or more license offers at various stages of finalization in each TT centre. Some of these may be regarded as mediocre, but experience shows that if a specialized company actively seeking new products does not find such products among the well documented license offers available it can often turn a

mediocre idea into a success when adding its own know-how of market and production techniques to a poorly documented idea. It also has to be borne in mind that the patent system in Europe, being based as it is on the "first to file" system (as opposed to the American system of "first to invent"), in a majority of cases makes it necessary to support a publicly displayed invention with a full patent protection.

Ad 5

Quite often national TT centres - if at all engaging in licensing activities abroad - are tempted to try in the USA or Japan, where the markets are large and homogenious, and where (especially in the USA) there is a much more developed licensing market. A host of brokers, mediators and companies are searching for new products. This means that with a comparatively small effort a license contract can be made for these countries. World rights are often granted, and a possible European licensee never gets the chance. It is thus necessary to create a pattern of approach to the problem designed in accordance with European conditions and to establish incentives and resources which will enable each TT centre to find European companies for licensees as easily or even more easily than finding licensees abroad in USA and Japan.

Ad 6

These barriers represent a real problem, but if technology transfer is performed by TT centres which have established good personal interrelations, experience shows that the importance of such barriers can be reduced. And, moreover, such barriers are most active in the initial contact phase. As soon as a meeting between licensor and licensee has been arranged and discussions on techniques, processes and market aspects begin the common terminology of marketing and engineering reduces the problems of cultural and linguistic barriers.

The ideal system

Taking into consideration all the issues described above the ideal system would be a network for technology transfer in Europe, where each country had 1-5 national TT centres (according to size) of a very similar structure, comprising services connected to most of the phases along the innovation chain and especially a very close contact to local industries seeking new products. These national TT centres have employees who know each other on a more personal basis, and the mutual confidence and cooperation is such that any TT centre through a joint data bank has access to products in other TT centres (also such products which are not fully developed). This data bank can be interrogated only by authorized TT centres. In this respect the joint data bank shared by the different TT centres is a closed circle, whereby information concerning new techniques can be exchanged in a closed network of TT centres without violating the novelty of the inventions involved. Through the European association these TT centres have exchanged experiences and are operating more or less in the same manner, but first of all these TT centres share a common electronic communication system, which allows them - by means of optical cables and satellite systems - to draw from a terminal not only text and figures from any other TT centre, but also photos and drawings.

This ideal system can only come into practise when interface equipment and computers are able to store and retrieve photos and drawings and/or when broad band techniques are available. This is supposed to take place during the next 5-10 years. In the meantime a system as the one outlined in the following chapter could be used on a transitory basis.

Chapter 6

Proposal for an EEC pilot project to improve the infrastructure of technology transfer in Europe

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First action

To solve the problem of lack of knowledge of TT centres, as well as problems with cultural and linguistic barriers, a European association has already been envisaged by the Commission. Furthermore, seminars and exchange of personnel has been foreseen in this first phase. In short, this first action could be seen as an attempt to create the personal network for licensing among the national TT centres which already exist.

Second action

To create a fast and visual electronic communication system it is suggested as a pilot experiment that each TT centre is equipped with a telecopier , the EEC to support the rental and connection costs for such telecopier with a major amount for at least one year. Such a system will enable each centre in a matter of minutes to forward requests for technology and to receive from other centres photos, drawings etc. pertaining to new products, which are in tune with the forwarded search profiles.

Third action

To remedy the lack of resources and incentives to establish a network for intereuropean technology transfer it is suggested that the EEC allocates to each centre financial support enabling each centre to cover expenses such as translations, travelling costs for industrialists and TT agents in connection with the first licensing meeting (should be managed under the European association, cf. first action above), funds to cover the contact phase for licensing, etc.

Fourth action

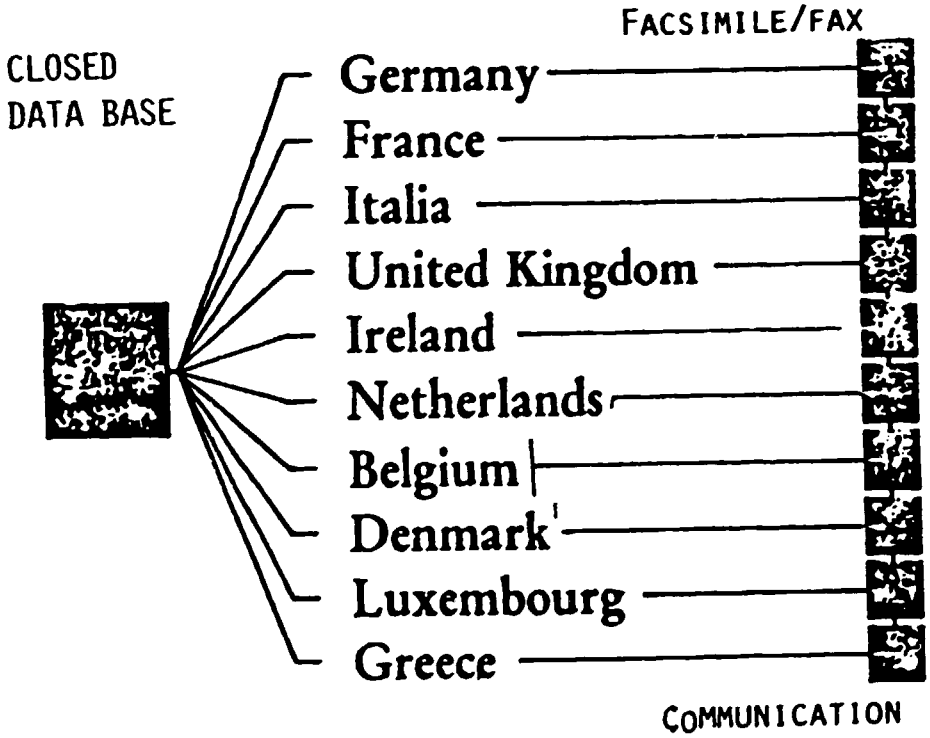
To remedy the drawbacks of the lack of an overall view of what is available of new technology and quests for technology in the different TT centres it is suggested that TT centres are connected to a joint data bank, this data bank being sectioned into a public part to be interrogated by everybody and a closed part, which can only be interrogated by TT centres. In the closed section of the data bank each TT centre could store inventions which are on their way in the system and some of them perhaps only partly documented. However, such partly documented projects could be of great interest to the proper industrial client in another European country.

In this connection it should be mentioned that the European data bank TRANSINOVE has the possibility of not only being able to offer this service, but also to allow TT centres (or their European association) to acquire shares in the data bank. This means that the sources of technology, the requests for technology and the owners of the data bank would come from one and the same group of persons. This would greatly improve the possibility of supporting the licensing process whenever a contact had been made through use of the data bank. (In this case it has to be remembered that both Dvorkovitz Instan TechEx and Control Data Technotec data banks have back-up systems for licensing). Moreover, such an arrangement might greatly improve the performance of the TRANSINOVE, which so far has only focused on the task of storing inputs and then wait for industry to come and use the data bank.

Industrial clients need an interphase between the data bank and their search profiles in the data bank, as these clients are only interested in new items of technology and do not care about the specific nature of the information system behind the retrieving of such license offers.

Final remarks

Figure 7 below may serve as a condensed illustration of how the proposed European infrastructure could be like.



From the illustration will be seen that the different national TT centres are interconnected through a common electronic communication system (facsimile/fax) and they share a joint data bank (TRANSINOVE or the ECHO data bank of the EEC).

Late in 1983 the Commission decided to run a pilot project, based on telefax installations. The final report from 30.11.1984 is reproduced in Annex 2 of CRP 1.

The telefax system does not replace the date bases but is an interesting supplement.

The telefax replaces the normal letter, it can be combined with or replace the phone call and the telex.

The advantage with telefax compared to the letter is primarily the time factor from remittance to receipt. The advantages compared with telex are the possibility to transmit drawings and the simple reproduction of the text.

The Commission have recently accepted a follow-up project. The aim is to enlarge the telefax net already set up and to compile a directory of TT-institutes and organizations that want to join the network and follow the "rules of conduct". (Rules of Conduct, Enclosure B of CRP 1).

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This presentation has primarily covered problems seen from the technology transfer organizations dealing with licensing and has illustrated a solution to some of the problems.

There are still many problems to be dealt with but the process itself of setting up the network has strengthen the communication between and knowledge of the national centres, and that is a very useful side effect.
