УДК 657. 92 : 339.166.5(075.8)

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TECHNOLOGY TRANSFER: AN EFFICIENT MEANS OF KNOWLEDGE FLOW

After the change in the political system, any necessary changes did not occur regarding many fields of the Hungarian economic and social life: after the millennium it started to lag behind the countries in East Central Europe, and in the increasingly growing competition it is forced to loose significant position. Defective decisions in field of economic policy resulted that the country became file-closer among altering economies. With the most significant macroeconomical indicators that are signed in the study, the loser Hungarian position is traceable.

Предприятия сегодня более отзывчивы к техническому и технологическому прогрессу, управляют своими активами технологий более стратегически. Тем временем, решении технологий перешли к людям незнакомым с динамикой технологий в лаборатории или на рынке. Интеграция технологий и повторное их использование страдают, не координируя структуру или форумы планирования бизнеса. Решение, согласно некоторым, является методическим подходом к интегрированной технологии, планируя названный «Технологией Roadmapping», который получил более широкое развитие в прошлом десятилетии.

Role of technology transfer in the economy. The factor to what extent a country can join the more and more intensive international technology transfers is one that has a decisive impact on the development of the national economy.

In the past few years it has been possible to observe two characteristic phenomena in the efforts of the countries undertaking dominant roles in the transfers completed for making the knowledge flow more intensive. One is the result of globalisation and company activities becoming more international, which can be shown in the steady growth of transfer traffic. The other is an effort manifested in the countries taking specific steps to balance their transfer balance and to ensure that it is in the black. [14]

An OMFB study (1998) relying on an analysis of OECD statistics highlights some important tendencies in this context: technology supply is much more concentrated than demand. The largest users are the service industries, while the

[14] The international flow of knowledge is surveyed by OECD primarily using the data of the technological balance of payments quantifying the foreign trade in brands, licences, know-how, patents, and intellectual services. Some analyses also study the data of investment capital including technology transfer. /Papanek, 2002/

majority of R+D expenditures are concentrated on narrow industrial fields; in evaluating technology diffusion, the expenditure on technology purchase is to be taken into account beyond direct R+D expenditures; the significance of imported technology has steadily increased in the past one and a half decades. In smaller, moderately developed countries like Hungary, its extent is over 50%; global, relatively barrier-free technology diffusion played a decisive role in the global increase in the efficiency of Information Communication Technology (ICT) sectors; technology diffusion has an efficient supporter in strengthening the transfer processes and their methodology and infrastructure support. This is of particular importance for small countries and for countries conducting intensive international trade.

The concept of technology transfer. The term technology is derived from the Greek language. The word used today is made up by connecting the words ‘techne’ and ‘logos’. The word ‘techne’ was used to mean manual skills or, in a more general sense, skills and ability. The word ‘logos’ corresponds to the content knowledge, science. And accordingly, the word made up of the two corresponds to skills, competence, aptitude for something in a broad sense of the word, and the knowledge required for it. (Shane, 1982). In a more general sense in today’s interpretation technology is a result of the synergic combination of four factors (knowledge elements) (Figure 1).

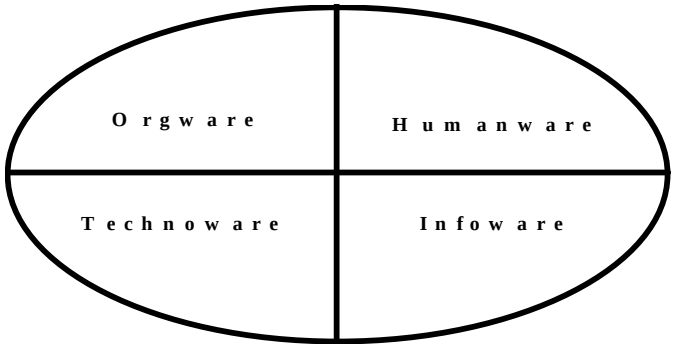

Figure 1 - Components of technology

The four knowledge carriers identified above can at the same time be regarded as the objects of technology transfer. In a general sense the concept technology is used to mean the elements of knowledge concerning the implementation of something, which includes the product and/or service to be created, the process of implementation (production – distribution) and the related additional knowledge (management, experience, competence). And technology transfer means the flow of all these technical and knowledge components between the various organisations and persons.

Today technology is defined in a broader sense as a specific ‘know-how’, a sum of knowledge (Shane, 1982). This interpretation has the essential feature that it does not narrow the concept down to the level of knowledge concerning specific production processes or manufacturing technology, but treats it as a complex set of knowledge necessary for creating an enterprise, organising and operating the systems of production and distribution.

If the term technology is used as an attribute of a transfer process, then we can accept the interpretation that it is indeed nothing else but a sum of the technical competences and immaterial knowledge that makes people and organisations capable of: perceiving new problems; elaborating new conceptions; elaborating new solutions; creating a new division of labour for people and organisations; as a result of which a new product and/or service is created. Transfer is passing on knowledge to those who do not have it (national economy, companies, organisations, and individuals). This new, ideal technology transfer also includes innovation, namely the innovation of the new, adapted system, which obviously satisfies a market demand on the side of end users, while it renews several social and economic potentials of the receiving party.

Transfer is always implemented in connection with some direct or indirect economic activity. It results in a special, targeted re-distribution of the outputs of the general development process. Today it’s clearly presentable feature is the effort aimed at imparting systemised knowledge. Technology transfer and adoption is not simply imitation of a particular idea (knowledge), but adaptation of the original so that it can best suit the typical sociological, political, technology, climatic, economic and education environment of the receiving party (Figure 2).

Technology transfer is implemented in various fields of production and services through the imparting and takeover of innovations and development results. Technology transfer makes it possible that: the receiver starts using the R+D results of others fast; the donor who has taken on the risky investments of R+D requiring large expenditures is able to share the burdens with others through the rapid economic exploitation of the results.

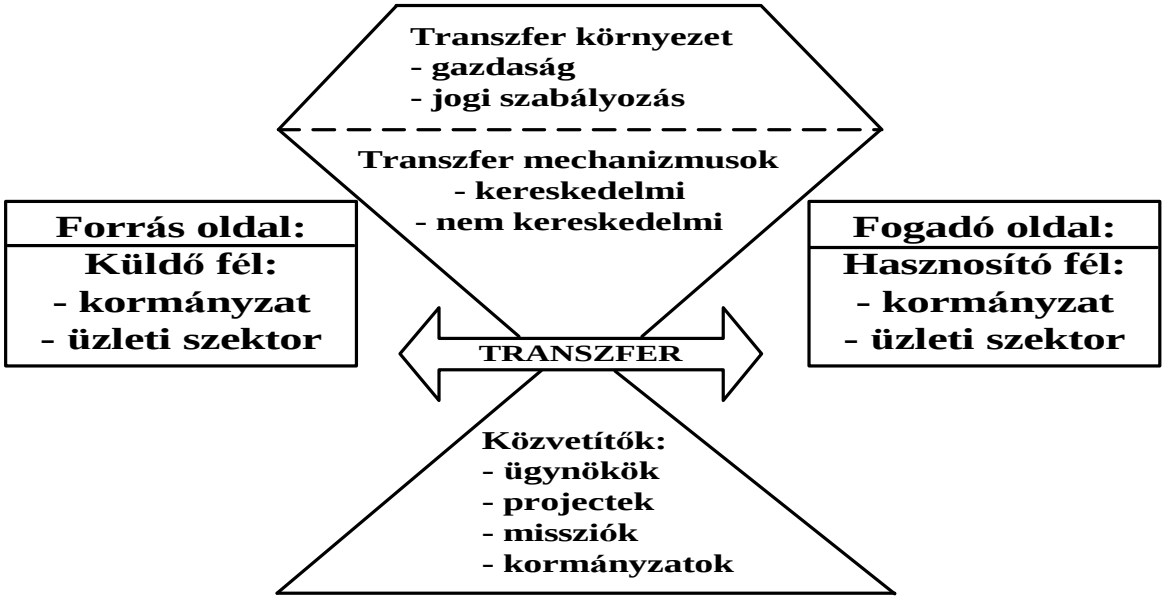

Figure 2 - Process and players of technology transfer

The technology gap and the resulting asymmetry (difference in knowledge) is the starting impulse and driving force of technology transfers. The reason for this is that scientific and technical resources show a highly concentrated distribution in terms of the world or individual countries. The imbalance activates and keeps the potential players in action who are trying to solve the imbalance. It is technology transfer through which – in the various moments of the innovation processes – the division of labour is also achieved, both on sector scale and at international level.

Concerning its content, technology transfer also includes the passing on and taking over of free knowledge as well as that owned by the proprietor (confidential – restricted). Free and thus public information generally ensures access to scientific research results. On the other hand, protected information contains specialist elements of technological knowledge and can be learned by methods controlled by its owners (patent, licence, etc.). Their extents and proportions are essential for the receiving side, for the decision makers stating their opinions here are frequently faced with tasks that can often hardly be solved. This general problem is referred to in the professional literature as ‘transfer paradox’ or ‘knowledge controller’. The essence is that „the technology that we want to obtain is basically the information that would be necessary in order to make reasonable decisions on the issues of purchasing or rejecting”. (Ambrosio, 1995). Decisions concerning transfer carry perceivably high risks, particularly when public information is available to a limited extent.

This is a frequently repeated basic situation in defence areas and in actions with an economic initiative. It is a well-known fact that innovative companies consciously raise the barriers to entering the market to a high level. One means of doing so is making the information on the novelty confidential, providing legal protection for it and embedding it in a way that allows movement only in a complete form (complete know–how.)

Transfer models. The processes of delivery and reception take place in highly different structures according to the intentions, interest enforcement methods and the integration extent of the cooperation of the players involved in the transfer, the donors and the recipients. In the following some models comprising the relations between the players and demonstrating specialist transfer strategies will be presented (Figure 3 and Table 2). Familiarisation with the models is essential because initial transfers are always established in the frameworks of the simpler models, and after a successful cooperation the adoption of more complex forms can begin. The experience gained in the transfers can provide a solid foundation for the conscious development of the embedding potentials of the receiving side, and through that for awakening the force of attraction. This may result in the establishment of cooperation according to more complex models, which may provide a sound framework for more intensive interest enforcement by the receiving party, and for the development of the active position. The models to be presented also represent a historical development series, which may serve as an informative framework for the evaluation of transfers in Hungary in the past ten years. Five types of the models describing the behaviour of the players of the process can be differentiated:

"**Contact building model":** It highlights the role of bridge-forming institutions ensuring information flow between the sources and the utilisers. These institutions bring about the connection between the demand and supply sides through enabling the potential partners to find each other while orientating them – through offering custom-made programs – in order to find the expedient mechanism.

"Diffusion model": It concentrates on connecting appropriate technologies and diffusion potentials. It finds the players interested in an expedient division of labour for the various moments of research, development and adaptation. Regarding its character, it is also able to embrace more complex mechanisms and makes it possible for the receiving side to utilise its diffusion potentials more efficiently. The contact-building model is first of all useful for starting or

occasional transfers, for it ensures cooperation between a small number of players in a transparent system. The diffusion model is the expedient model for mass, fast, spatially widely spread diffusion, where the presence and coordinated cooperation of a great number of players can be ensured on the recipient side.

“Problem solving model”: It starts from clarifying the requirements accurately. It looks at the requirements as technology deficiencies to be solved and from this starts a problem solving process. In its framework it comes to the final solution through determining the directions of adaptation from the potential solutions. It is an important element of this logical system that it is not satisfied with a simple examination and qualification of the supply, but in the course of selection also qualifies the adaptation willingness of the donor. This way of thinking does not simplify transfer through a simple putting over of the possible technologies offered, but regards the optimum possible satisfaction of the fundamental demand as its main objective. In formulating the problem and searching for a solution it relies on the active participation of the prospective recipient organisation. Regarding its character, the model exceeds simple commercial transactions and fits supplementary developments ensuring the complete satisfaction of the demand on the recipient side into the system. This latter feature may ensure the development of products and technologies meeting the specialist demand of the local markets.

“Action-oriented model”: It combines the elements of the process on the basis of economically established utility. This thinking starts from the fact that a decisive moment of active marketing arrives in the lifecycle of every novelty. This occurs under competitive conditions. The innovative diffuser enjoys an advantage in this competition if he can cooperate in the early stages of diffusion with adaptors who are prepared and forced to loyalty by contracts. This adaptation does not mean simply passing over and increasing mass, but improvement matching the local requirements also appears in it. It is not by chance that this model is well-spread in the practice of international companies primarily when the parent company (donor) has to cooperate with a recipient country and target market with a culture very different from the culture of the donor’s country (e.g. the European projects of Japanese companies, large US companies in African countries). Each of the companies thinking in terms of a global strategy has applied similar solutions in the early stages of its internationalisation.

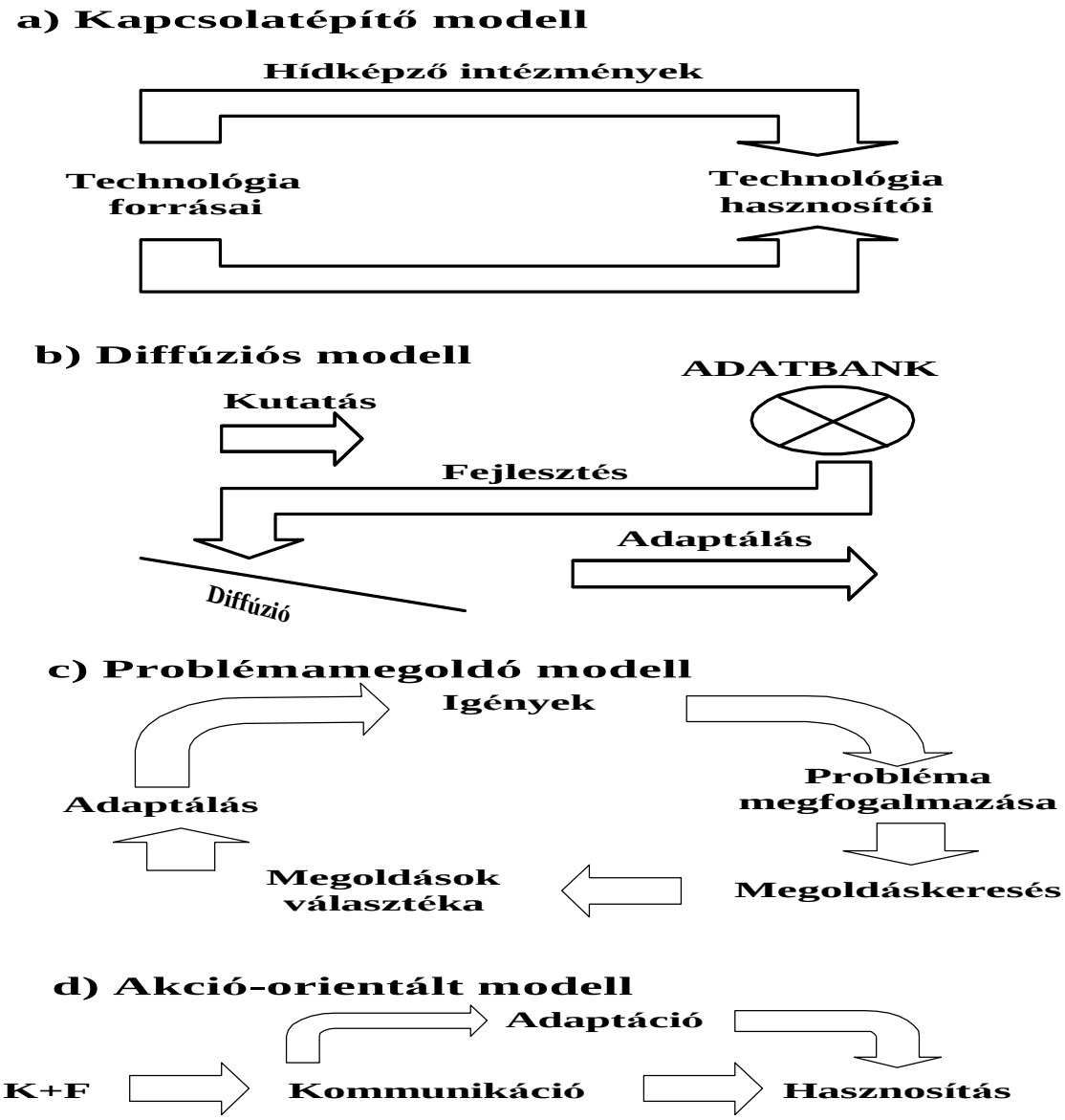

Figure 3 - Technology transfer

The model based on Knowledge exchange including feedback as well is today becoming more and more prevalent (Figure 4).

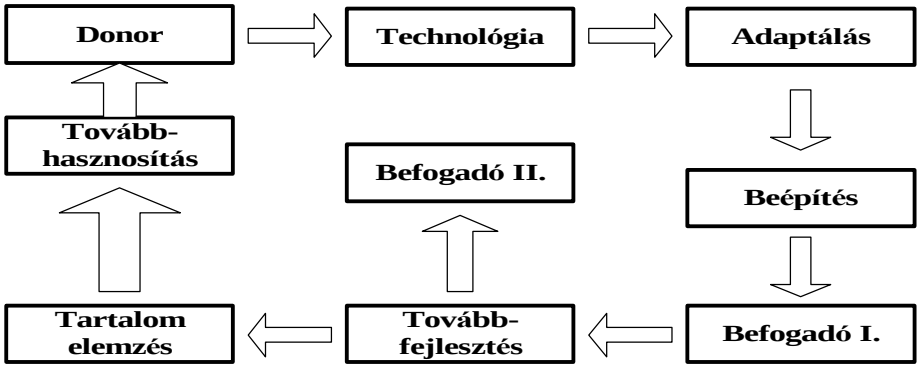

Figure 4 - Model built on knowledge exchange

– ..... Table 2 - Comparison of technology transfer models (based on Mogavero-Shane, 1982)

Feature	Contact building model	Diffusion model	Problem solving model	Action oriented model	Model built on knowledge exchange
Basic idea of the model	Connecting supply and demand	Creating the conditions for rapid diffusion	Eliminating technology problems	Preparing many channels of utilisation	Exploiting the advantages of mutual learning
Key players	Bridge-forming institutions	Communicators	Requirement-oriented adaptors	Specialist adaptors	Developing recipients
Crucial process elements	– finding supply-demand – partner mediation	– loading a databank – surveying diffusion potentials – communicati on	– exploring requirements – formulating problems – searching for solution methods – setting adaptation directions	– predicting utilisation directions – searching for partners – building adaptation bases	– developing embedding programs – building bases for improvement – analysing knowledge content
Typical transfer mechanis ms	– building turnkey systems – wedging in technology	– licence trade – embedded technology trade – training programs	– patent transfer – know–how transfer – technology service purchase	– joint ventures – internal techno partition – affiliated companies	– external techno partition – reciprocate and cross licence transfer – Joint venture – joint R+D programs

“Model built on knowledge exchange”: The model is closed in one direction through the donor party monitoring consciously in a pre-planned manner and, in many cases, encouraging and assisting the improvement efforts of the recipient party. In order to compensate for the efforts and expenditure in this, it supports transfer towards a third party as well. In addition, it takes over these development results and after appropriate analysis, builds them into its own new programs. In the new transfer cycles then it becomes possible to disseminate these novelties globally. This model is clearly observable in transfers within international companies and in projects aimed at the transfer of production means and methods. In the first case the interpersonal relations within the companies and the off-site R+D departments are the driving forces of the process. In the second area it is primarily the customer service organisations that do the necessary information collecting through their monitoring system. The model is actually an efficient means for implementing external and internal ‘techno partition’, which is nothing but a conscious sharing and moving of knowledge, technology and resources between the appropriate transfer players while maintaining mutual benefits.

Technology transfer as a means of creating knowledge. When creating technical knowledge, the transfer of knowledge can be performed at different levels. One extreme is when the process is simplified to the physical takeover of a machine, equipment, or device, while the other is when technology is learned to be operated with the best degree of efficiency in a process of up to several years (von Hippel, 1988; Ray, 1969) and in the meantime significant adaptive modifications are implemented on the original system. The events and outputs of this process also

depend on the extent the innovation can be regarded as competence destroying or competence enhancing. In such a complex technology transfer program both individual and corporate learning is required. Individual learning begins with collecting experience related to the technology and the understanding of this experience creates the individual knowledge modifying individual abilities and knowledge. Corporate knowledge is a sum of the individual knowledge of persons. Here synergic effects prevail on the one hand, and, on the other, the organisation learns only to the extent that the persons are able to change the results of individual learning to corporate routine (elements building the culture). In the transfer process of complex systems the exchange of knowledge takes place at two levels:

level one: A knowledge package summed up by the creators of the technology and connected to the operation foreseen. This assists the widening of the knowledge of the recipient directly.

level two: A knowledge package created at the recipient of the technology in the course of use and adaptation. This may have very intensive creative and innovative elements (reinvention). The knowledge created by the user also moves in the reverse direction and the information important for the innovator may provide initial impulses for planning the next generation or concrete solutions.

Four levels of the transfer of technology competences can be differentiated: Level 1 - copying the activity; Level 2 - complex adaptation of the activity; Level 3 -ransfer of the scientific knowledge behind the technology; Level 4 -nteractive cooperation between donor and recipient. The levels denoted here also mark in general the development stages in the cooperation of the lasting transfer partners and represent the borders of the frameworks that can be gradually developed. Limits and characteristics of knowledge transfer:

1. Technical knowledge is highly differentiated and immobile, for it also includes user experience. This experience also carries in itself innovative elements, for taking over a technology involves the incorporation of new inventions.

2. The central task of the potential donors and recipients of advanced technology is to deconstruct the limits of knowledge. This cannot be an isolated activity, but presupposes a specialist cooperation network of the various participants.

3. Mediating institutions are wedged in between the donor and the recipients. The tasks of these institutions are diverse: mediating know-how from the donor to the recipient; flowing back user knowledge from the recipients to the donor; providing methodologies for accelerating individual learning processes; documenting experience gained in the course of individual learning, formulating it in a way

suitable for passing on; methodological support for corporate learning, accelerating it and initiating the changes required for this purpose.

4. The work of mediating institutions is efficient because the benefits resulting from an economy of scale appear in them. Each of the recipients experiences every moment of receiving and incorporation as an individual event. They cannot draw generalisable conclusions from these phenomena that appear to them as individual. The mediator on the other hand obtains unique experience and institutionalisable knowledge bases through synthesising the 'individual' phenomena and evaluating the repetitions.

Knowledge centres – knowledge regions. **With the exception of the simplest cases, transfer means both imparting and taking over knowledge and experience. Imparting the knowledge accumulated in the course of R+D can only be successful if the previous qualifications of the receiving party make it possible to implement organised transfer of knowledge.**

Under the conditions of the global competition every company is looking for the innovative receiving medium supporting its activities all over the world. Regions, which develop within countries and across borders partly in a self-organising way and partly as a result of conscious development, in turn look for investors that help in increasing the economic potential of a particular area. Looking at it from an industry policy aspect, a region is nothing else but a specialist, active network of economic players where the participants are implementing a very close and intensive collaboration concentrating on supporting each other. The central core of the network is a production company forming a closed professional culture surrounded with suppliers, institutions providing financial and consulting services, government and private laboratories embodying R+D moments.

In operating the network, a central role is played by regional governance leaders who can deliberately support the learning process as a result of which regional networking organisations are brought about. Technology transfer and the diffusion of information cannot be successful in international and national frameworks if the local channels ensuring final distribution and directing it to the target are not created. What are called Knowledge Creation Fields (KCF) – or innovative regions – have been organised in order to complete these efforts fully. KCFs have deliberately developed development policies, infrastructure and networks of institutions for supporting diffusion, intensifying international technology transfer and receiving the relevant learning processes. Such Knowledge Creation Fields are today the province Baden-Württenberg in Germany, the Centro-region in Portugal, Toscana in Italy, Steiermark in Austria and the port cities in Ireland. According to international experience, there

are ten significant factors which enable creating an innovative region and its intensive connection to international technology transfers:

- Concentration on the requirements of the global market, in choosing the technologies it is not meeting the local requirements that is crucial, but exports.
- Creating the possibility for getting involved in international commerce.
- Efforts at integration through networking with local, national and international partners.
- Intense cooperation, concentration on strengthening own competences. In the framework of project organisations, there is a stronger chance for the small and medium-sized enterprises to grow than in isolated activities.
- Systematic strengthening and widening of the knowledge base. Openness to receive novelties.
- Plotting a vision taking into account long-term perspectives and including preparation with foresight.
- Continuous learning both at organisational and at individual levels. Building connections with sources of knowledge.
- Looking for opportunities to get involved in knowledge transfer not only as a recipient, but as a donor as well.
- A supportive local innovation network of institutions.
- Generating the establishment of new enterprises.
- Building monitoring systems to predict changes in the environment.

New tendences in choosing transfer objectives. It is a tendency that can be increasingly observed in the choice of international companies looking for transfer partners that they move towards knowledge centres. The range of comparative advantages has come to include parameters that can be connected to knowledge creation and knowledge diffusion. They have become the aspects of comparing and selecting the recipient side (see Table 3). In the decade to come, global competition will basically concentrate on renewable human capital and the knowledge resulting from it. Knowledge-based industries will be able to create the products and services with the high added value enforced by the competition. These companies will develop their networking systems so that they move towards the knowledge centres that are today only being formed but will intensively multiply later. The reason for this is that this is the way to obtain and take advantage of competitive advantages. Knowledge / Learning Regions will be created where valuable, well-qualified workers (knowledge workers) are concentrated and there is an appropriate, flexible local infrastructure available, partially for their employment and partially for operating the information and communication infrastructure necessary for

implementing the tasks. Knowledge-intensive regions (centres) will be prepared for the 'just-in-time' movement of information, persons and knowledge. National, local and government organisations, global companies and local enterprises will be organised into networks built on mutual benefits that are open and become accessible to everyone. Their joint objective is to create and propagate jointly technologies carrying new, competitive advantages.

Knowledge centres and regionalisation. Looking at it from an industry policy aspect, a region is nothing else but a specialist, active network of economic players where the participants are implementing a very close and intensive collaboration concentrating on supporting each other. The central core of the network is a production company forming a closed professional culture surrounded with suppliers, institutions providing financial and consulting services, government and private laboratories embodying R+D moments. Knowledge centres are a new type of innovation institutions in the economy and society getting globalised and localised. As compared to the former types of institutions built on the classic linear innovation model, their structure and operation show typical differences.

Problems of *knowledge production, knowledge transfer and knowledge utilisation* have come to be in the focal point of the innovation model. Within that, priority issues are as follows: opportunities for exploiting knowledge advantages; dynamics of equalising knowledge; methods of sharing knowledge; supporting learning processes.

New tasks of innovation institutions, in line with the above: creating and updating the knowledge base**;** ensuring intensive and efficient possibilities for using the knowledge base**;** ensuring the accessibility of the knowledge base.

Main areas of sharing the knowledge: Sharing between the players in the creation of knowledge *(problem of comprehension and codification);*Sharing between the producers and users of knowledge *(problem of transfer);* nsuring multiple use of the knowledge *(learning problem);* nsuring the spatial distribution of knowledge *(problem of centre –decentre);* Ensuring the even distribution of knowledge *(diffusion problem).*

Accordingly, the institutions of knowledge distribution are organisations built on high level information technology, or their formal and virtual networks. Examples include the following organisations developing both from government and private sources: service providers offering information technology**;** service providers offering network system services**;** service providers offering network content services**;** service providers operating network search systems**;** service providers

offering regular information selections**;** service providers supporting e-mail and communication groups.

Knowledge centres exert their influence in connection with the innovation basic institutions of the surrounding environment and influence their further development as deviating from the traditional.

The structures of regional innovation systems and the networking possibilities of the regional knowledge centres are thus closely interrelated with each other. Knowledge centres play an important role in organising, establishing and operating the networking systems covering the world /cooperation networks, strategic alliances, service providing networks, R+D networks, etc./. Networking can be regarded as a new form of development. A crucial moment in the establishment of networks is the widening of market competition, where the competition also between industries and regions became intensified. In this situation, medium-sized companies, international companies, government and private research and development laboratories were all forced to apply cooperative strategies (what is called pre-competitive cooperation). Here government-level cooperation projects have resulted in a cohesion effect in addition to private initiatives. Today cooperation exceeds the moments of R+D and production – marketing, and is increasingly widened with project-specific phases of training – as well as advanced training, which induces intentions of cooperation in an increasingly wider range of professionals. This enlargement tendency also indicates that the practice is beginning to exceed the transfer mechanisms built on the simple linear innovation model and the networks are aiming at inducing direct synergic effects.

Altogether knowledge centres with various orientations generate favourable effects in the following fields (in general according to stressed priorities):

a) ***Concentrating intellectual capital:*** The intellectual capital concentration is created in space and time, which recreates the information-interest relations between the activities of the innovation process that often break away from each other. They reduce in a proven way the uncertainties and risks of R+D. They provide room for individual initiatives to develop that are rejected in a different medium. They develop a partnership or alliance relation between different professional cultures that do not frequently meet.

b) ***Concentrating relevant information:***By providing the intellectual and infrastructural framework of open information flow, they find connections between the separated participants of the innovation process. In many cases they take over the costly, time-consuming and knowledge-intensive tasks of selection through their

specialists, thus offering a fast and secure way of obtaining knowledge to their 'lay' partners.

c) ***Concentrating equipment:***They create an up-to-date technical, informatics and service infrastructure also for those who would have to go without it in lack of investment funds.

d) ***Concentrating services:***The range of services may extend from a technical character to complex management consulting. They offer alternative opportunities for use. These provide a safe professional background primarily for beginning and small enterprises.

e) ***Providing opportunities for supplying industry activities:***Beyond R+D moments, they ensure the starting conditions for the fast start-up of production.

f) ***Creating a favourable atmosphere for personal contact building:***They can maintain the effect of direct personal contacts improving the psychic climate.

g) ***Increasing economic efficiency:***Major elements of the improvement of economic efficiency (reducing the critical R+D and investment capital requirements, better utilisation of capacity due to the joint use of equipment, fast running-in, financial benefits, lower specific expenditure requirement of joint services).

h) ***Stimulating the entrepreneurial spirit:*** Favourable conditions and successful examples that can be presented assist in a bolder entrepreneurial decision making. The benefits that can be offered can be mitigated by the starting barriers.

i) ***Improving the employment situation:*** Wide-reaching demand for labour appears primarily in the final production stages. The quality factor that appears in the regional binding of the 'qualified elite' is not negligible either.

j) ***Increasing the attraction of the regions:*** They attract enterprises looking for new locations through the secondary networks arising in the surroundings of the institutions.

Functions of the knowledge centre. In establishing knowledge centres, conscious efforts should be made at developing a varied and easy-to-diversify activity structure and infrastructure, mixing the advantages and service structures of science parks, technology transfer institutions, technopoles, competence /excellence/ centres, incubator houses and industrial parks. The knowledge centre is: an explorer of the available local and the accessible global knowledge; an arranging, frameworking and storing agent of the potential knowledge; a mediator of demand for knowledge and a generator of demand for knowledge; a leading adaptor and innovator, an active player in venture capital mediation; a builder of connections between the large and SMEs level economic players; an organiser of the innovation network and supporter of cluster initiatives as the economic and public administration centre of the region.

The main mission of the knowledge centre: 1. The knowledge centre as the cradle of innovation: R+F activities, creating innovations, creating knowledge: ensuring the accessibility of innovative technologies; active transfer partnership. 2. The knowledge centre as the driving force of diffusion, a basis of sharing knowledge: diffusion, reception and redistribution of knowledge, knowledge flow: mediating information, mediating partners. 3. The knowledge centre as a cluster centre: collector of specialists, a polarisation centre of expertise: new critical resource masses and personnel conditions, providing technical and technology services, providing infrastructure, providing incubation services.

4. The knowledge centre as generator and mentor of regional development: mixing global and local knowledge, ensuring knowledge flow in regional dimensions, maintaining an international relation network.

Table 3 - From a mass production region to a knowledge region

ASPECTS	*MASS PRODUCTION REGION*	*KNOWLEDGE REGION*
• Sources of competitiveness	Sources of comparative advantages • availability of natural resources • relatively inexpensive labour	Sources of renewable advantages: • creative-innovative medium • continuous development
• Products–services	Mass production: • cost advantages • division between R+D and production	Knowledge-based production and services: • high added value • combination of production and innovation
• Production infrastructure	Centralised plant with a local range of suppliers, and reduced task division	Innovation chain built on supplier network
• Human resources	• low qualifications, low wages • narrow training • target-oriented trainings	• knowledge workers • life-long learning • induced corporate learning projects
• Technical background	Strong reliance on local infrastructures	Global communication and IT infrastructure
• Corporate management system	• division of authority ensuring the dominance of the parent company • top-down control	• mutually beneficial relations • networking organisations

5. The knowledge centre as a regional technical service providing centre. As compared to those of large companies, it is a differentiating feature of the innovation activities of SMEs that they are built on using continuous external expert involvement and services in all its stages. Typical areas are: technical services /measurements, validation, experiments, leasing laboratory equipment, etc./; expert services /interpreting, document translation, business administration services, business and legal counselling/; business organisation counselling /marketing, technology, production organising/; technology services /leasing labour, renting workshop space, rapid prototyping services/; logistic services, R+D services; technology transfer services /partner search, project writing, licence trade, capital organisation, organising venture companies/.

Literature. 1. *HIPPEL, E. A.* (1977): Has a costumer already developed your next product? Sloan Management Review, Vol. 18. No. 2. pp. 63-74. **2.** *Korean Science* and Engineering Foundation (1994): Science and Engineering Research Centre. Daejun City. Korea. **3.** *Papanek G.* (1999): Az innovatív vállalatok illetve a K+F intézetek, egyetemek és hídképző intézmények együttműködése. GKI Gazdaságkutató Rt. **4.** *OMFB* (1998): Technológia, foglalkoztatottság, versenyképesség az OECD országokban. OMFB, Budapest. **5.** *SHANE, R.* D.(1982): About Technology Transfer. Dekker E. N. York. **6.** *SZAKÁLY D.* (2001): Transfer of Technology - Transfer of Knowledge. (In: Business Studies. A Publication of the University of Miskolc.) Vol 1, Number 1. Miskolc. Miskolc University Press. 2001. pp. 179-191. **7.** *SZAKÁLY D.(*1999): Technológia transzfer - tudás transzfer. Felzárkózás, értékrend változás a vállalati és intézményi gyakorlatban c. konferencia. 1999. május 12-14. Miskolci Egyetem. Miskolc-Lillafüred. 264-279.

Подано до редакції 05.06.2009

УДК 330.43

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ИССЛЕДОВАНИЕ И ИСПОЛЬЗОВАНИЕ МАТРИЧНЫХ СТРУКТУР

Вначале, управление подразумевало сокращение штата контроля поточных линий. Развитием автоматизированных систем массового производства поток lean-management нельзя было продолжить. В это время ценность штата лидеров и служащих "макро-" организации была подчеркнута. Матричная семья эти усеченные версии обединяет в себе. Фактически, эти структуризованные матрицы прибывающие из организации сети эффективности.

At the beginning, lean-management meant control staff reduction of production lines. By the development of automated mass-production systems, this stream of lean-management was not a practice any more. Leaders' and employees' staff leaning of the "macro" organization have been brought into focus. Matrix-family synthetizes these truncated versions. In fact, these structurized matrixes exploite benefits coming from networking effectiveness.

Под реструктуризацией организаций подразумевают как сокращение числа уровней, ступеней организации, так и согласование единиц (подразделений) данного уровня с точки зрения организации и выполнения работы, снижение потребности в координации, или же хотя бы стремление к этому. Естественно, такой процесс реструктуризации, можно понимать частично в любом режиме организации /деятельности, или же его осуществление связано с определенными условиями и последствиями. Мы, без пересмотра возможных альтернативных вариантов структуры и координационных средств, можем принять как тенденцию, что к середине 1990-х годов общераспространенным стал *дивизиональный* метод организации и деятельности, то есть в случае крупных интернациональных предприятий можно говорить о формировании и распространении матричных структур с 2, 3, 4 измерениями, которые базируются на данном методе. Возникновение матричных организаций