

*Six Countries Programme
on Innovation*

*AUTUMN WORKSHOP 1998
19 & 20 November, 1998
Budapest, Hungary*

KNOWLEDGE TRANSFER IN THE INFORMATION AGE



PROCEEDINGS

Organised by:



The papers are included in the proceedings as kindly provided by the authors.

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Six Countries Programme on Innovation (6CP)

The Six Countries Programme (6CP) provides an international network and forum for experts and practitioners engaged in research on innovation and related public policies. It aims at a better understanding of innovation processes, their development and at assessing the impact of Science and Technology on public policies and programmes.

The Programme was established in 1975. There were four countries represented at first but increased to six in 1976 and now there are ten. The name has become so well known that it has been kept, regardless of the number of countries represented.

6CP Conferences and Workshops

Each year two major conferences or workshops are held on research aspects of innovation. A Six Countries Conference always has a specific theme, highlighted in formal presentations and discussions. The workshops are more informal with keynote speakers to stimulate participation in interactive discussions. A report is published for each event synthesising the presentations and discussions.

Who participates at 6CP Conferences and Workshops?

Participation at a Six Countries Conference or Workshop is by invitation of the Steering Committee. The aim of these events is to provide a forum for an open-minded exchange of information, reflection and assessments of new developments of topical themes. Representatives from public institutions, industrialists and experts engaged in innovation related research work present information on new developments and current policy, practical experiences as well as reflections and concepts. Participants do not speak as a formal representative of their institution, thus creating an informal and confidential atmosphere.

The Autumn 1998 Budapest Workshop

The Budapest Workshop of Six Countries Programme was closely connected to the previous events of "6CP" and used their results as its starting points. Under the title "**Knowledge transfer in the information age**" it formed a "workshop of open questions", of new approaches, stimulating ideas and lively disputes. The multiple facets of the information age's new phenomena need new ways of thinking, open mind and free, unrestricted discussion. Therefore there was room at the workshop for articulating divergent or provoking views and getting familiar with other participants' thoughts. Sufficient time was given to workshop-type discussions following each presentation. There were only a few papers in each half-day session, so they could stimulate interesting and profound debates.

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**KNOWLEDGE TRANSFER IN THE INFORMATION AGE
SIX COUNTRIES PROGRAMME WORKSHOP, BUDAPEST
PROGRAMME**

Thursday, 19 November, 1999

13:00-14:00 Registration

14:00-14:15	Introduction and welcoming by Mr. András Siegler , executive vice president of OMFB and member of the Steering Committee
14:15-18:00	SESSION 1: Information society and knowledge based economy Chair: Mr. Lennart Elg (S) 1. Mr. Gunnar Eliasson (S): <i>Industrial Development in the Knowledge Based Information Economy: A Competence Bloc Analysis</i> 2. Mr. Walter Hudetz (D): <i>Europe's Way Towards the Information Society: Current Initiatives and Activities - an Information Pool</i> Coffee break 3. Mr. Pál Tamás (H): <i>Centre-Periphery Relations in the Information Age - A Reinterpretation</i> DISCUSSION

Friday, 20 November, 1999

9:00-12:30	SESSION 2: Learning and organisational learning in the knowledge based economy Chair: Mr. Gunnar Eliasson (S) 1 Mr. Christian Galinski (A): <i>Multilingual information society.</i> 2. Mr. Tibor Vámos (H): <i>Education for: ?¹</i> 3. Mr. Jari Koivisto (SF): <i>Experiences and comments on "Finland Towards Information Society" Programme</i> 4. Mr. István Fodor (H): <i>The role of knowledge in the increasing competition</i> DISCUSSION
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14:00-18:00	SESSION 3: Knowledge transfer in networks and consortia Chair: Mr. Stefan Kuhlmann (D) 1. Ms. Katalin Szabó (H): <i>Revitalisation of the market or reconstruction of the hierarchies? - Declining companies and emerging networks in the information age</i> 2. Mr. Philip Shapira (USA): <i>Evaluation of USNet - a federal-state collaboration in the United States</i> 3. Mr. Wolfgang Gerstlberger (D): <i>Public-private-partnerships: suitable instruments for the development of regional information resources?!</i> 4. Mr. Dominique Foray (F): <i>Knowledge Transfer and the Economics of High Tech Consortia</i> DISCUSSION AND SUMMARY
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¹ Unfortunately, Dr. Tibor Vámos could not participate at the workshop.

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"From local to global " - The global knowledge market and local learning

Summary paper by Katalin Szabó

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"For 50 years, the information revolution has centered on data--their collection, storage, transmission, analysis, and presentation. It has centered on the "T" in IT." Today, however, the question of "what does information mean and what is its purpose" is asked increasingly often and is gaining great significance. (*Drucker* [1998] p.47.) The participants of the "Knowledge Transfer in the Information Age" Budapest Autumn Workshop of the Six Countries Program attempted to answer these questions. Instead of examining surprising new features of the diverse world of information technology, machinery, techniques or software, the nine lectures¹ and numerous valuable comments concentrated on the meaning, purpose and goal of knowledge acquisition and knowledge transfer, on the changes in knowledge and its diffusion. As Professor *Eliasson* pointed out in the first lecture, knowledge itself was rarely discussed in the 70s, the fact that it is a major issue in academic discussions today is actually a development of the past decade. Thus, the theme of the Budapest Workshop of the Six Countries Program was a new facet, a "hot topic" that is more the question of tomorrow than today, and one that will predictably gain even more significance in the future.

Knowledge based economy and learning - The major issues of the workshop

It is a cliché that information technologies effect all walks of life; from transportation to entertainment and education to health care it is omnipresent. The knowledge transferred to in the theme of the Workshop is not merely a technological issue, but - as *Gunnar Eliasson* emphasized it in his lecture, an institutional, economical, cultural one as well, or rather, the organic whole made up of these. The success of the conference was due among others to the fact that the participants treated the topic in its complexity, avoiding the traps of one-dimensionality and simplification.

The knowledge based economy that was in the focal point of the conference is taking form and expanding right before us. "A recent report by the OECD estimates that more than half of total GDP in the rich economies is now knowledge-based, including industries such as telecommunications, computers, software, pharmaceuticals, education and television. High-tech industries have almost doubled their share of manufacturing output over the past two decades, to around 25 per cent, and knowledge-intensive services are growing even faster. By one reckoning, 'knowledge workers' from brain surgeons to journalists account for eight out of every ten new jobs. (*An Acknowledged Trend* [1998])

¹ Unfortunately, out of the originally planned eleven lectures, two presentations (Tibor Vamos's Education - for What? and Christian Galinski's Multilingual Society) could not take place at the Workshop due to illness. This was regrettable for the 70 Hungarian and foreign participants who were awaiting their thoughts with interest.

p.43.) Knowledge based economy is also a system where it is not only the growth of the narrow segment of knowledge industry that is generally defined by the effectiveness of knowledge transfer, but that of all economic fields.² There are nonetheless two specific areas where knowledge transfer is particularly intense, and are thereby even more sensitive to its efficiency. These are education and the business sphere - from microfirms to transnational companies. It was not the organizers' optional decision or the lecturers' specific interests that placed the topic of the discussions of the participants from eleven countries (Sweden, France, Germany, Finland, Austria, Ireland, the United Kingdom, the United States, Hungary, Canada, and the Netherlands) within the bounds of these two ranges of subject. The focus of the workshop were defined by the reality of the Information Age. The "chief organizer" of international conferences: "chance", did not get much of an opportunity to speak this time.

The determination to concentrate on major issues explains the fact that two of the three half-a-day sections, the second and the third were devoted to the question of education and learning; education in both the narrower sense and organizational or inter-organizational (network) learning. This topic was discussed by *Jari Koivisto's* (National Board of Education, Finland) analysis of Finland's progress towards an information society and by *Dominique Foray's* (University of Paris Dauphine, IMRI) presentation on "Public knowledge, private property and the economics of high tech consortia." *István Fodor* (Ericsson Hungary) talked about the role of knowledge in Ericsson Hungary's position in the market, while the author of this paper (*Katalin Szabó*, Budapest University of Economic Sciences) presented a paper on business networks, the intertwining of hierarchies and the market and relevant Hungarian case studies as well. *Philip Shapira* (Georgia Institute of Technology, Atlanta - Fraunhofer Institute, Karlsruhe) in his presentation "Promoting Industrial Networks: Learning from Policy Evaluation - The Case of USNet" and *Wolfgang Gerstlberger* in his "Public-Private-Partnerships: suitable instruments for the development of regional information resources" both introduced the subject of knowledge and the diffusion of knowledge in unique relevance to national projects or other co-operational forms.

If we consider the lectures in the *first section*, which covered the dilemmas of the information society and knowledge based economy, the quintessence of even these were related to problems of learning, and gathering and processing information. Professor *Gunnar Eliasson's* (Royal Institute of Technology, Department of Industrial Economics and Management, Stockholm) presentation, as its title also imparts, concentrated on knowledge based economy and *competence blocks*³ that contain and transmit edge. The European road to an informational society was a prominent concern in the lecture delivered by *Walter Hudetz* (Fraunhofer Institute, Karlsruhe), while *Pál Tamás* (MTA Institute of Sociology, Budapest) gave a much appreciated dynamic presentation on knowledge production, export and import specific to semi-periphery states (including transition countries.) This recent introductory paper will not attempt to recapitulate the main thoughts of the delivered lectures. The Reader can obtain precise information on

² Although some low-tech industries are never represented as a part of knowledge based economy, they are in fact an essential part of the multifaceted infrastructure of the economy as a whole, of an economy which is built on the basis of the dominating modern productive factor: knowledge.

³ A competence block is the sum of all capabilities and knowledge that are necessary for the introduction of a radically new product or technology.

what was said directly from the authors of these papers by reading the following papers of this volume. All interpretation can turn out to be a misinterpretation, and all of the lectures deserve to have the Reader become acquainted with them in their original richness of content and form. Therefore, instead of presenting a summary, we would like to call attention to the interesting questions that arose during the course of this unusually lively conference.⁴

The introductory speech delivered by *András Siegler*, the vice-president of OMFB (National Committee for Technological Development), the host of the Workshop, was thought inspiring to begin with. He said that the conference had a dual purpose; to function as a tutorial and as a discussion. In fact, it is quite difficult to differentiate the two, as a discussion is a tutorial in itself. Opinions different from our own, or even conflicting with ours, and the divergence of opinions in general make learning unavoidable. The organizers of the Workshop managed to avoid the trouble that is a threat to most conferences of this type; that of the lack of time allowing only ex-cathedra statements and polite alibi-questions instead of a true debate. Discussions occasionally became passionate, but the characteristic fashion of proceedings was one of mutual attention and a wish to learn. The discussions might best be described by a phrase of Erno Osvat, a prominent figure of Hungarian culture; they were "beautiful debates". "A beautiful debate is one where the two sides are equally, or almost equally, right. A beautiful debate is one that reflects the true incompletion of conscience. A beautiful debate is one that teaches us patience."⁵

However, the debates were not only "beautiful" but interesting and multi-lateral. The questions discussed might well turn out to be starting points of further study and research, since new approaches and new problems surfaced; from the unresolved problem of efficiency measuring in knowledge based economy to the contradictions and intertwining of global and local processes, and the possible role of transition countries (and small countries in general or those that started the information revolution later than average) in global learning processes. After a general description of the Workshop, we will give a taste of the debate through presenting a few crucial problems that emerged.

Reinterpreting time: Informational paradoxes and competence blocks

Both in the history of science and contemporary life, new phenomena usually appear in the guise of an anomaly or a paradox. It is difficult to place new knowledge on the old map. Most of our knowledge is still connected to the products of a material economy and their distribution, while economic reality is now mostly comprised virtual economy. Knowledge as an economic factor behaves very differently from goods or machinery. It is no wonder that, as it was formulated in *Gunnar Eliasson's* presentation, information, the new "driving force" behind economy brings up a set of paradoxes. Professor *Eliasson* mentions three major paradoxes. On one hand, in the Information society we are less and

⁴ All presentations were followed by a mass of questions and contributions which seemed endless. In some cases, the debaters could not come to a conclusion by the end of their discussion, they merely interrupted it to give way to the next presentation.

⁵ Osvát Ernő (1988): Az elégedetlenség könyvéből. (From the Book of Dissatisfaction), Helikon Kiadó, p.42.

less informed, and are only capable of processing a decreasing portion of the exponentially growing stock of knowledge.⁶ The gaps in our knowledge are perpetually growing, we are trying to compete against time. The Professor's second paradox is to do with quality. In his words: "We are less and less informed about that what is more and more important: i.e. quality." The innovation race mainly aims to produce new, better quality products, not to make the production of the old quality product more rational or cheaper. Quality is developing a strong bond with innovation and knowledge; the information society is the "society of quality". And thirdly, the complexity of knowledge makes individuals or companies incapable of fully assessing problems. One can only see a part of the complex unit, as is the case in the tale where blindfolded men were led to an elephant and asked what it was. The man feeling the elephant's leg thought that it was a staunch column, the one holding its trunk was convinced that it was a garden hose, but none of them could feel the "whole" and come up with the right answer. Fractional information is always misleading, and the mistakes only grow larger when mediators, brokers are used to connect fragments of knowledge. Therefore, perhaps we should call the information society the "misinformation society," as misinterpretations increase proportionately with the complexity of knowledge.

The first informational paradox in the debate was also described in a different way. It is not only that economic actors access an increasingly small proportion of knowledge-stock, but that established knowledge-stock is reevaluated or loses its value rapidly while competition for knowledge-flow, or new knowledge, is becoming more and more frantic. The access to this knowledge flow, as Professor *Eliasson* put it in answer to the questions and contributions, is never merely the individual's affair, it always happens in teams or communities. This is what the competence block approach - presented by Professor *Eliasson* - expresses.

"In advanced industries, call them high tech, the competent customer interacts actively with the producer and contributes "market close" competence.⁷ The innovator is the technological bridge-builder, the entrepreneur identifies commercially interesting innovations, and the competent venture capitalist discovers ("understands") the commercially viable ideas of the entrepreneur as such that he is willing to participate with reasonably priced equity finance. The actors in the secondary markets also have to be reasonably competent to provide exit opportunities for the early venture capitalists, also under reasonable conditions." (*Eliasson* [1997a] p.11.) The diffusion of knowledge and the access to knowledge-flow is also greatly influenced by the labor market. It could be said that in the world of permanent restructuring, knowledge is often carried on "two

⁶ The so called *Barnaby Rich syndrome* is quite similar. Named after an Irish army doctor of the 17th century, it is the name given to the misgivings over the overflow and exponential proliferation of literature. But what would Barnaby Rich have to say about circumstances today and the quantity of necessary literature (and not only technical literature) currently needed? It must be acknowledged, however, that the self-same technical innovation, the computer, which is to be held to account for the burgeoning collection of knowledge, is also an effective instrument in processing it. Yet, the key to the problem lies not in the capacity of machines, but in the *cognitive capacity and learning capabilities* of humans.

⁷ At first sight, the concept seems similar to that of an "industrial cluster." However, it is "a distinct from input or technology defined industrial cluster formation like Dalman[1950] physically defined development blocks and Carlson's [1995] technological system representing a generic technology, like robots, that can be used in many industries." (See *Eliasson* [1997a] p.10.)

legs," it is transferred from one place to another, from one company to the next, by employees changing jobs. This mode of knowledge transfer is especially favorable to transmitting *tacit knowledge*, the type of knowledge that cannot be compiled in a manual, but can only be spread through personal contact. The debate contained many interesting thoughts on the question of whether it is a flexible labor market or a secure work environment that aid knowledge transfer to a greater degree. Undoubtedly, the constant rearrangement of the labor market is simultaneously a condition for and the result of rapid technological changes and the continuous flow of innovations.

The knowledge incorporated in products grows obsolete at an accelerated rate, parallel to the product's diminishing life-cycle. As *Philip Shapira* surmised in his contribution to the debate, the position of the secondary actors of the market within competence blocks is becoming critically unstable. The actors in question are less and less capable of fulfilling their original role, i.e. to provide an "exit opportunity" for venture capitalists involved in more mature fields of industry and thereby letting them free their capital for a new phase and sphere of innovation. Innovation and rapid development is also hindered by other factors, especially in European countries. In truth, as Professor *Eliasson* pointed it out, the United States is the only country where all the necessary conditions for a well-functioning competence block are given. In Europe, the activities of the chief conveyor of industrial dynamism, the venture capitalist, are checked by the fact that European societies are unwilling to resign themselves to the extreme polarization of riches that would develop between the venture capitalists who create new industries and those subsisting on the peripheries of information society.⁸

Unfortunately, it is not only the everyday man that is unable to realistically judge the assets of futuristic companies that appear from nowhere and reach the peak of high-tech industries within a year or two, but the stock market as well. We should not be surprised by the fact that it is becoming more and more impossible to predict the changes in a volatile market that shifts at an imperceptible speed and goes through tectonic changes in a minute. It is also quite paradoxical that the knowledge of the future in a sense stems from the knowledge of the past, yet we cannot rely upon our familiarity with the past to anticipate the future. However, it is not only the future that we are uncertain of. The whole of the information economy is concerned with problems of measurement and evaluation, and these were lengthily discussed at the Budapest Workshop as well. It seems that assaying material goods is much simpler than evaluating virtual commodities and intangible assets.

The measurable and the immeasurable

Kelvin is thought to say "What we cannot measure, we cannot know." If the great physicist was right, the map of knowledge-based economy is still full of uncharted waters. In *Dominique Foray's* opinion, *Eliasson* took a revolutionary step in a work of his ten years ago in suggesting that instead of measuring the *Maclupian* "knowledge sector" - a

⁸ Bankers - as noted in a paper of Prof. *Eliasson* - are "incompetent" venture capitalist. They do not understand entrepreneurial ideas and provide unreasonably priced financing. "If there are only 'bankers' in the market, as is the case in Europe, the entrepreneurs will be left out in the cold and be predated upon when they are close to giving up. (See *Eliasson* [1997b])

sector restricted to a few concrete fields of industry -measurements of the whole knowledge based economy should be made. However, he does not see much progress in this department. Eliasson's point of view has had a great influence on how low tech industries are treated, as the technicus terminus "knowledge based economy" includes low tech industries as well as esteemed high tech industries. Yet, regardless of how influential Gunnar Eliasson's contribution was, not even the most optimist economist could state with surety that the measuring of knowledge based economy is resolved, or even solved to a degree.

Measuring IT investment and their output is difficult. This is because most of IT benefits are qualitative, indirect, and diffuse. When we were principally a manufacturing or an agricultural economy, we could count and estimate output quickly, and the services that are more difficult to count and estimate were much less important to the overall economy. However, in what is now a knowledge-driven economy, services are very important. Unfortunately, we still estimate much of our data with many of the same programs we used thirty and forty years ago, when the economy was very different from what it is today. (*Fleming- Jordan - Lang* [1996] - cited by *Fleming* [1996] p.62.) As a contributor fittingly remarked in a later phase of the debate, statistics of national economy are still preoccupied with the appraisal of K+F investments and the estimation of the number of employees in a research laboratory, and are, in actuality, incapable of reflecting the realities of events in a knowledge-driven economy. New concepts of output and new ways to measure quality changes over time should be developed, because economic output is becoming *less tangible, more service-oriented* and based on rapid innovations. We may need a wide range of evaluation methods, some suitable for evaluating one type of knowledge based economy features, and some suitable for others. Technological changes and increasing global competition also mean that we benefit, because goods and services provide us with increased quality, variety and choice. We have begun to measure increased quality but we have no measures for increases in variety and choice. The way we measure and think about the capital stock is also changing as human, intangible capital becomes just as important, if not more important, than machinery, equipment, buildings and physical capital. (*Fleming* [1996] p.63.)

Gunnar Eliasson, on reflecting upon what was said in the debate, warned us to treat the issue of measurement with caution. He observed, that while companies are trying to get a hold on knowledge capital⁹, they are essentially conservative as regards the established methods of measurement. When it comes to making decisions, they can only deal with intangible assets on a intuitive basis. However, measuring should not be made a fetishized. An international comparison of the relative state of countries as regards their stage of development towards a knowledge based economy is possible with a comparatively large degree of accuracy, but it would be very dangerous to use data of this type in political debates. Nevertheless, we cannot avoid measuring the output and characteristics of a knowledge based economy, and producing data and figures in the process.

⁹ Highlighting this trend, several Scandinavian companies have begun publishing an appendix to their annual reports, assessing their knowledge assets. The idea is to give the investment community a better understanding of a company's true worth. (In: *Blaw* [1997] p.4-5.)

The presentation of *Walter Hudetz* from Fraunhofer Institute(Karlsruhe) who held a lecture on the European road to an information society, also referred to the question of measuring. During the debate following the lecture, the problematic question of how to evaluate the various European programs that serve to facilitate informational development was discussed as a matter of great significance. How can it be measured?

The Importance of Evaluation

After Walter Hudetz's presentation on the European road to an information society there was a question connected to measurement as well. How could the effectiveness of European projects be measured when we only have definite information on the funds invested, and how could we make statements about the results of such a program or assess its effectiveness or the amount of additional knowledge stemming from it, when knowledge has no valid unit of measurement? Investment can be counted easily, but profit is elusive to assessment. Evaluating the effectiveness of programs sponsored by companies is less problematic, since these can be judged to an extent by the effectiveness of the companies themselves. Yet the number of SMEs sponsored by a program could only be treated as a true result if the profits of the sponsored programs and networks flowed back into European circulation. It was also mentioned during the ensuing debate that the steps taken towards an information society and their consequences should not only be interpreted in the terms of information technology. Information technology is neither knowledge, nor information, therefore the Bangemann report which concentrates on information technology is fundamentally faulty in its approach to the problems of Information Society.

In his answer to questions and comments, *Walter Hudetz* brought up various - planned or already implemented - examples of European evaluation, e.g. the evaluation of a telecommunication application program. He also contrasted his view with the approach that reduces problematic aspects of knowledge transfer to questions of information technology instead of producing a genuine evaluation of knowledge and information. Concurrently, he pointed out that knowledge and technology should not be treated as two distinct and independent phenomena. Information and knowledge could hardly be transmitted at the same rapidity without the current technological advancement and it would also be impossible to base the whole economy on knowledge without it.

The Re-evaluation of Place: Local Problems in a Global Information Society

One of the most extensively discussed issues of the Workshop was the conflict between and intertwining of global processes and local societies and communities. This problem emerged in many presentations in many forms. The participants of the debate based their approach on the fact that economic globalization and the ascendance of information technologies are reconfiguring the spatial organization of society and economy. "The mainstream account of economic globalization, found in the media and abundant in economic analysis, emphasizes hyper-mobility, global communications, and the gradual neutralization of place and distance." (*Sassen* [1996] p.630.) However, as it can be concluded from the presentations and contributions at the Workshop, the problem is significantly more complex than this over-simplified account. As we learned from *Jari Koivisto's* presentation, the Finnish society presents a characteristic facet of the necessity

of redefining place and distance in its dynamic and resolute advancement towards an information society.¹⁰

Connecting the Local and the Global - the example of the Finnish education sector

"Finland is a country of a vast area and few people. This has led to a situation where the average number of pupils or students in a particular school is quite small. There are hundreds of primary schools having only one or two teachers and under ten pupils. Therefore it is essential to make effective use of computers and telecommunication in providing information and exchanging education materials in many cases." This is how the speaker described the typical starting point, where the key to the solution of the problems of strictly 'real' places and 'true' distances is to be found in global networks that make distances disappear, in a 'place without a space', i.e. in virtual space. At the same time, the enforced global solution to local problems has many favorable side effects. As the Finnish speaker put it, by using computers and networks appropriately, it is possible to create an *open and flexible learning environment* in classrooms. The teachers must communicate actively with other teachers, other schools, enterprises and teachers in other countries in order to keep up with the new ideas in education.¹¹ Students in especially remote areas benefit from distance learning arrangements, as well as those who must work outside normal work hours or those with irregular work hours. Distance education is implemented in primary and secondary school education as well.¹² It is almost completely irrelevant where the child was born, regardless of whether he or she lives in the capital or the desolate Northernmost parts of the country, the quality of education remains unaffected. In the wired Finnish school-system, all pupils and students, regardless of the location, can get the same knowledge or information. The significance of this is immeasurable in the development of the country.

The Hungarian Suli-net (School-net) program mentioned by *András Siegler* in his opening speech attempts to do the same on a smaller scale. Unfortunately, unlike amongst our language-relatives from the North, the Finnish, the program has not been set in motion in all schools. Although the distances in Hungary are much smaller and therefore less determining than those in Finland, the distribution of knowledge between the eastern and western parts of the country and between the capital and the countryside is disturbingly disproportionate. The Finnish program presented by *Jari Koivisto* should serve as a model worth attentive study for the representatives of the Hungarian educational authorities.

¹⁰ Finnish government to launch an information society program called "Finland towards Information Society" spanning from 1996 to 1998.

¹¹ "The cultural change in schools towards modern, open, interactive and co-operational learning environment is hardly achievable only by adopting the measures previously mentioned. There are about 20 pilot projects launched aiming to create and test new methods of using ICT as a key element in learning environments." (See Koivisto, Jari [1998]: Experiences and Comments on "Finland Towards Information Society" -Program in Finland. Conference paper p.4.)

¹² See Koivisto, Jari [1998]: Experiences and Comments on "Finland Towards Information Society" - Program In Finland, Conference paper, p.2.

Globalization Against Isolation - The Novosibirsk Syndrome

Jari Koivisto's presentation also uncovered another interesting example of how local communities and global communication devices are connected in the Information Age. Paradoxically, global networks can help sustain the existence of local languages with a mere few hundred native speakers living at great distances from each other. These people could only meet in 'real space' by overcoming great obstacles, while they can easily converse in virtual space and keep their languages alive. The conclusion that can be made from this case concurs with the opinions of those that do not view globalization and local communities as mutually exclusive opposites but as also having an effect of strengthening both of the phenomena involved.

Pál Tamás discussed the relationship between global and local from a singularly unique aspect in his presentation on isolated communities and hyperactive individuals on the Net. He calls this phenomenon the '*Novosibirsk Syndrome*' after the home city of a young Siberian scientist who returned to his country after a few semesters spent in the USA and understandably felt isolated. Due to this, he pursued a somewhat hyperactive behavior on the Internet. Regardless of how paradoxical it might seem, it can be said that the greater the degree of local isolation is, the greater the desire for global communication becomes. This and similar phenomena "require going beyond mainstream notions of the impact of globalization and the spread of information technologies to localities--i.e. the relative powerlessness of localities confronted with hyper-mobile capital allows us to re-conceptualize processes of economic globalization as concrete economic complexes situated in specific places. Such a focus decomposes the national economy into a variety of "sub-national" components, some profoundly articulated/integrated with the global economy, with many of the resources necessary for global economic activities that are not hyper-mobile and are, indeed, deeply embedded in places, notably places such as global cities and export processing zones, and many communities that may appear wholly removed from global processes." (*Sassen* [1996] p.631.) Global processes are structured by local constraints, including the composition of the work force, work culture, the prevailing political culture and processes. Economic globalization contains both a dynamism of dispersal and a dynamism of centralization, a condition that is only now beginning to receive recognition. These companies develop their products and services in places where the know-how is available, buy materials and components where they are cheapest, produce in countries with the lowest labor and distribution costs, and sell their products internationally. Although global companies require huge investments and must therefore be large, they must also be small enough to respond quickly to local markets.

Elephants, giraffes, swallows and eagles

The problems of globalization and localities were treated in Pál Tamás's presentation through the inspection of smaller 'semi-peripheral' countries¹³ research frameworks. In these countries, where, regardless of their relative backwardness, full-scale research is being conducted, the behavior of the scientific elite can be placed along two axes corresponding to two dimensions. On one hand, the representatives of the sciences can be set somewhere on the local-cosmopolitan dimension depending on whether their positions signify an appearance on a local or the global market. On the other hand, they can be

¹³ The presenter lists countries such as those in the Mediterranean and even Austria.

distinguished on the basis of whether they belong to the elite due to the positions they gained or their actual productivity and functions (This latter one was measured by the citation index.) Using these character-parameters, the presenter set up a framework shown in a matrix's boxes of four types of elite. In his interpretation, these types are: firstly the locally and position-based elephants, who, like the animal, are large and grey, 'drab', the giraffes, who are also part of a positional elite, but are such in a more cosmopolitan way, thirdly the productive swallows functioning in a local environment, and finally the eagles, who also gain their elite status for their productivity as well, but are cosmopolitans active in an international scientific sphere. These representatives of the elite do not want to sell anything in the local markets. The eagles publish mainly in English, for the international research community. In addition to scientists of the natural sciences, representatives of social sciences and economists are also included in this part of the elite. In Pál Tamás's translation of this to the language of economy, there are representatives of the scientific community whose interests lie in import-substitution, i. e. they work for local markets, and there are those who are export-oriented producers. Mixed strategies can also be observed in the behavior of semi-peripheral countries' academic elite; some groups are exporters and import-substituters concurrently.

According to Pál Tamás, the scientific elite also takes the function of a *gatekeeper*, i.e. the controller of the information and the money that govern research. The mediators of the scientific market; editors, editing committees, the groups that control the information while it is being transmitted from point A to point B also had an important role. In his opinion, we have been experiencing radical changes in this department in the past few years. The number of periodicals and publishers is rising exponentially, and people are taking the marketing of their scientific work into their own hands. Thus, a great number of small markets for parts of sciences are born, which make the controlling of any particular field of science nearly impossible. The power of the previously influential controlling-mediator groups is waning. *Pál Tamás* remarked that the direct sale of working papers on the Web will lead to the same type of fragmentation.

It is an interesting point that the picture of the academic world painted in Pál Tamás's presentation shows a similarity to tendencies in the industry. The lucid, controllable, large-scale market of mass production is becoming characterized by an increasing amount of differentiation and diversity which also manifests itself in making the market less controllable and competition more intense. This striking similarity is most probably not the work of chance, the common underlying factors are those of the demands of the Information Age and the development of information technologies.

Finally, *Pál Tamás* drew our attention to the fact that there is an interesting 'switch' taking place. In contrast to tendencies of globalization and internationalization, local knowledge¹⁴ is gaining value. This is closely linked to the more sophisticated decision-processes of local decision-making centers and the enlarged demand for information that it

¹⁴ Philip Shapira directed attention to the reverse relationship between the global and local phenomena. An interesting trend can be observed in the United States; technical universities working for and entangled with local markets are becoming distanced from localities and their previous strategies connected to local business communities, and are getting involved in exploiting global opportunities. A similar phenomenon can be detected in the strategies of leading universities; high-quality educational institutions do not look upon their local region as their natural market anymore, and they often offer their educational services and courses to a world-wide market.

produces. Local and global become inseparably entangled in this situation as it is actually global challenges that are the underlying motivation behind the mentioned local information demand. As a type of reaction to the openness of the Web and the standardization of masses of information, the academic elite is making recurrent attempts at creating new spheres with sealed boundaries and new forms of exclusivity. Global openness and local closeness depend on each other and co-exist in the Information Age.

The question of the role of local and global factors in the creation of knowledge surfaced in the ensuing debate. Is new knowledge created on the peripheries, where thinking is not as standardized and there is more space allowed for new, non-standard ideas, or in the centers, where research conditions are obviously better and the scientific community is more mature? Instead of treating the situation as an exclusive choice between the two, he opted for an approach that emphasizes making the knowledge created in the centers 'digestible' for local communities, which requires a translation-program based on a type of local knowledge.

Nonetheless, as *Gerry Sweeney* brought it up in the debate, the free flow of information does not mean that the centers do not try to control this process. In connection to this, Philip *Shapira* mentioned those university centers (near to thirty in number, mostly in the USA, but also in Europe and on other continents) that have a good chance of being able to dictate the terms and speed of globalizing education and research. *Gerry Sweeney* also remarked that the English language itself is a selectional factor which pushes publications not written in English to the peripheries. The above seem to be the instruments of globalization, but even in the centres of it, localities have a marked significance. Tacit knowledge is as important in the Silicon valley as it is in the North-Italian town of Piacenza, he noted to emphasize the importance of place and of the locally set, difficult-to-transmit tacit knowledge. The innovations which are adhered to tacit knowledge are also tied to place and are deeply embedded in local societies, social interactions and culture. This produces a counterpoint of globalization.

The relationship between centers and peripheries is an important aspect of localization and globalization. Scientific development, although initiated in the centers, could become stationary if the centers take up a prominently leading role. In contrast to rigid centers, as it is shown in examples from the history of science, the peripheries often provide a possibility of rejuvenation. As a direct consequence, the centers get transferred after a certain amount of time has elapsed¹⁵.

Europe and the Information Revolution

The intertwining of global and local processes puts on an atypical aspect when the 'place' in question is a whole continent. "Throughout this century, the former scientific and technological supremacy of Europe has dissolved, with only few signs of improvement over the last couple of decades. The major obstacle on the road leading to Information Society is that the EU has failed to apply its scientific research strength to aid strong technological and economic performance. This phenomenon has become known as the 'European Paradox' (*Kofler* [1998] p. 53.). At the same time, technology is recognized as

¹⁵ The center of sciences in Europe was originally in Italy, then England and France, later on in Germany, while the research center today is on another continent, in the USA.

a motor for economic growth and prosperity in the international environment.¹⁶ However, it is as a consequence of this realization, that the program for a European Information Society has become a priority on the agenda of the European Union. The European Commission has initiated several projects aiming to smooth the passage to an Information Society. In his presentation, *Walter Hudetz* focussed on two of these activities. He analyzed two basic projects, of which the first is the *Global Inventory Project (GIP)*. It contains information about projects, studies, etc. underpinning the development of Information Society and builds upon and complements on-going national and international initiatives. *The European Survey of the Information Society (ESIS) Project*, launched in 1997, has set up a database based on an inventory of Information Society projects and actions in EU countries. The objective is to produce an Internet-based multimedia inventory of national and international projects¹⁷, studies and other initiatives related to Information Society. It aims to provide a tool for knowledge, communication, partnership, and the promotion of the best practical examples. The ESIS can be used as a compass for all major actors and helps the promotion of Information Society. The debate following the presentation was, as previously mentioned in connection to measurement, mostly centered on the discussion of to what degree these databases are utilized by the institutions, companies and citizens of the European Union, and what the conceivable direction of development is.

Reinterpretation of the market and competition: companies in knowledge networks

The traditional goal of performing repetitive tasks more efficiently is not enough to gain a competitive edge in a knowledge-based economy. Innovation is the key to supporting competitiveness, speed is more important than costs. What's more, the costs often depend on a company's capacity for learning and innovation. A company must become a learning organization in order to meet the accelerated pace of change, and people must develop the learning skills that serve as the basis of innovation.

A Hungarian learning and networking organization: *Ericsson Hungary* One of the best examples of this is the development process of *Ericsson Hungary*¹⁸, whose knowledge-based strategies in the hyper-competitive global markets were presented by *István Fodor* on the second day of the Workshop. It is widely known that R&D activity is the cornerstone of Ericsson's global philosophy. However the company is shifting R&D away from the corporate headquarters in Stockholm to its business units - and customers -

¹⁶ EC: Perspectives Jar International Co-operation in Research and Technological Development. COM (95) 489. Cited by [Angelika Kofler](#). (In [Kofler](#)[1998] p.53)

¹⁷ Information on more than 1,600 national and international (EU wide)projects on IS issues can be obtained directly via Internet by connecting to the ESIS database

¹⁸ Ericsson Hungary, which has become an organic part of the international giant company, started from scratch in 1991 as a satellite-firm of Ericsson, and became one of the largest telecommunications companies in Hungary. Ericsson Kft. is also the largest company dealing with applied research and software design. Gaining this position became possible for the Hungarian company through joining the global company that employs more than 95,000 workers.

around the globe.¹⁹ The company heavily relies upon local knowledge everywhere in the world, and connects local knowledge-creating power to the world-flow of knowledge.²⁰ According to its CEO-ic motto "*the company goes where the competence is.*" *Ericsson Hungary* followed the same principle within the country; it searched for 'hot points' of concentrated knowledge and competence and established itself in these places. One of such establishments is the company's high speed laboratory at the Budapest Technological University. With this step, *Ericsson Hungary* took a great modernizing leap in setting up one of the most up-to-date organizational forms to increase competitiveness; that of a university-industrial research consortium.²¹ The prestigious Hungarian Technical University and other educational institutions that are recognized as the suppliers of talent are potentially well-positioned to emerge as the prime knowledge-suppliers of companies. Yet, as it was underscored by *István Fodor*, university people must undergo the psychological transition of adaptation to the business environment. Previously, research was conducted according to its own logic and schedule, on a "l'art pour l'art" basis. However, researchers can no longer avoid coming to terms with the fact that, as *István Fodor* put it, "all research except for the most fundamental, has a concrete aim and deadline." Cooperation between the research community and the company is decidedly fruitful - he noted. The company provides a framework where ideas born in academic circles are carried out with an eye on the realities of the world that prevents the active imagination of scientists from getting out of hand. Men of science therefore turn their attention to projects and research that are useful and practicable. On the other hand, the company has to focus on knowledge and research to a much greater extent than formerly. As Professor *Eliasson* astutely remarked in the debate, competitive companies are actually "technical universities" where teaching and learning is the main profile.²² *Ericsson Hungary* is also a pioneer amongst Hungarian companies in that it gives research work in various fields to 120-140 talented PhD students due to its recognition of the fact that the carriers of the most current knowledge are no longer the professors, but the PhD students and even the younger student generations.

In *Ericsson Hungary*, networking process do not only appear within the network of its global company or in its cooperation with the Academia. A spectacular twenty-first-

¹⁹ Currently, Ericsson employs around 20,000 people in 40 R&D centers in 20 countries, out of a total workforce of 95,000 spread across more than 130 countries. Although 60 percent of R&D personnel are still located in Sweden, the home base accounts for only 3 percent of total sales. (*Blau* [1998] p. 4.)

²⁰ *Ericsson's* strategy is unquestionably up-to-the-minute in this respect. *Prahalad* calls this the "fourth phase" of companies' global roles. The stage of decentralizing research is far beyond the practice of the first stage, where international operations are treated as an ugly stepchild and international departments consist basically of "one old executive with an airline ticket." *Prahalad* argues that many companies have yet to fully abandon the old model of "corporate imperialism," in which emerging economies were viewed as nothing more than new markets for old products and old ideas. The new challenge - *Prahalad's* fourth phase - is to engage emerging markets not only as a source of revenue but as cradles of innovation. (Cited by *Kahn* [1998] p. 206.)

²¹ Ericsson's development is in accordance with the international experience that "there is a strong correlation between organizational reform and technical innovations. Companies opting for modern organizational solutions have a great inclination for introducing technical-technological innovations and vice versa: the utilization of a basic technical innovation requires companies capable of thinking in forms other than the traditional organization." (*Szabó, Katalin* [1998]: Revitalization of the Market or Reconstructing Hierarchies? Declining Companies and Emerging Markets in the Information Age. Conference paper for the Budapest Autumn Workshop of Six Counties program. p. 16.)

²² In other words: many managers must function as "*coaches*" in today's companies. (*Olalla - Echeverria*, [1996])

century manifestation of its networking can be seen in the 'virtual center' initiated by the company. Transnationals in Hungary involved in telecommunication and software technology (*Microsoft, Westel, Matav*, and so on) universities and research centers all participate in this project. The virtual center, launched in February 1998, collects research initiatives lacking finance and discusses these at workshops where the projects deemed possibly profitable by a board of scientific and company professionals are consequently financed.

This modern form of cooperation was born out of the recognition that besides traditional factors, innovation and learning are also highly influential on a company's share of the market. The role of consumers is also becoming more important in the worldwide competition of companies.²³ Customer-orientation has become the primary concern of successful companies. As *István Fodor* pointed it out, a company that wants to retain its position on the market has to find out consumer demands, not merely sell its products. A question on the secret of *Ericsson Hungary's* successful fortification in the first sensitive period after its foundation²⁴ led *István Fodor* to comment on the eminently important factor of joining international networks, self-presentation. A company that does not know how to present the knowledge and competence concealed in it cannot be successful. Central-Eastern European companies should especially take notice of the fact that a company's marketing activities do not end in promoting the market success of its products anymore. The importance of '*selling*' the knowledge concentrated in a company cannot be overemphasized.

The role of the market and hierarchies in networking

The case of *Ericsson Hungary* clearly delineates the definitive role of networks in knowledge-transfer. In accordance with *István Fodor's* approach, network development was a pivotal point in *Katalin Szabó's* presentation, but her treatment of this turn-of-the-century question was from a somewhat more theoretical viewpoint. "The emergence of information technologies has eroded the fundamentals of traditional economies: vertically integrated corporations have been replaced by a completely new corporate architecture," she introduced the topic. Multilevel hierarchies have been breaking up and have given way to global and regional networks of business units coordinated by the market. The presenter argued against viewing the organizational revolution merely as the advancement of the market and the strengthening of classical market competition. In her opinion, the ongoing process of deconglomeration or disintegration is *far more complex*. The rapid development of information technologies also produces a decrease of transactional costs, especially those of communication. This not only enables large companies to transfer originally internal functions to the market in the form of outsourcing, but also casts a new light on the workings of hierarchies.²⁵ New information technologies have the effect of diminishing the expenses of monitoring, internal controlling and of overseeing complex systems. Therefore, instead of immersing themselves in the obsolete dilemma of 'the market vs. hierarchies', *companies are seeking the optimal combination of the two basic principles of governance*. The decrease of internal transactional costs also means that the corporation itself is turning into a network rearranged out of its *internal modules*, and that

²³ See *Brannback* [1997]

²⁴ As it is well known, the death rates of companies is the highest in the period shortly after their birth, and 80-85% of the companies do not survive to celebrate their 5th anniversary.

²⁵ See *Zenger - Hesterly* [1997]

market-like strategies and reactions proliferate within companies as well. Simultaneously, hierarchical features can be characteristic of commercial networks composed of individual entrepreneurs, e.g. in manifestations of the *McDonald's Syndrome*. In the age of global networks, spatial placement in new organizational structures is increasingly losing its significance, especially as regards to what is 'within' and what is 'outside.' Nowadays, the units of economic organization resemble LEGO-blocks²⁶ instead of the clearly defined units of the past. Modules connect with each other on a 'whatever is the most practical in the given situation' principle. Transactional, coordinating and overseeing costs have dwindled to the point of being able to provide for permanent reorganization and an ad hoc corporate organizational structure. This genders an ability to adapt to turbulent changes and surpassingly capricious shifts of circumstances. The previously only periodically activated function of learning and teaching thus becomes the most important mission of business organizations. As this does not seem to fit into the established theories of industrial organization and market, a thorough revision of existing theories is called for.

Although it might come as a surprise to outside observers, these 'hot organizational innovations' have infiltrated the Hungarian economy as well. The second part of the presentation *Katalin Szabó* devoted to the networking of Hungarian companies, outlining four types as characteristic of the regionally existing networks. The presenter gave a detailed account of the "*Dunaferr-case*" to illustrate her point. The Hungarian state-owned steel and metallurgy company seems to be a convincing example of the fact that successful adaptation is impossible without network organizing and adopting new information technologies, and, in general, turning towards knowledge and learning. In the short discussion following the presentation, fresh developments and corrections were brought up and discussed, along with the substance and future of emerging network organizations.

"Private versus public" - the relationship between the state and companies in a knowledge based economy

The public-private consortia, which were *Dominique Foray's* main topic, are a distinct type of networking. Mr. Foray's presentation addressed the issue of privatizing knowledge; i.e. the extension of the private sectors towards areas and fields of knowledge production which were previously cataloged as public property. "As knowledge becomes the basis of the whole economy, the ownership of it and the inadequate production of knowledge as public goods is becoming a paramount problem," began *Dominique Foray*.²⁷ The presenter analyzed the solution and the mechanisms implement in finding the optimal balance between the need to share knowledge within networks to facilitate collective invention and the need for a degree of private protection to ensure a recompense for those who invest private resources in R&D projects. She mentioned two specific solutions to the problems connected to knowledge-production and the investor-creator's ability to reap profits from it:

²⁶ See *Des, - Rasheed.- McLaughlin.- Priem* [1995], p.7.

²⁷ As it is widely known, this is the consequence of the fact that knowledge is a good which is non-exclusive, and it is costly to make it exclusive or to control it privately. Knowledge is highly portable and fluid. It is far more difficult for a company to protect intellectual property (ideas) than physical property (machine-tools). However, if the profits of knowledge are not enjoyed only by those that brought it into being, the interest in producing knowledge weakens.

1. A certain degree of "natural excludability". Knowledge, in its early stages of development, can hardly be reduced to a "formal set of instructions." Tacit knowledge has a principal part in newly developed knowledge, and seems to be a transitory source of intellectual capital, yielding rents for those who possess it.
2. A "spontaneous" remedy is for agents to engage in bilateral relations to internalize external benefits. The natural tendency for the creation of these institutions - taking the form of R&D consortia - reduces the size of externalities

From a policy point of view, legal dispositions aiming to restrict knowledge use can be complemented with R&D subsidies (R&D tax credit, or direct subsidies) to help private agents cover the costs of the resources engaged in the process of innovation. Government funding would only be justified for projects which the private sector did not find sufficiently attractive, and which, however, have high social returns. There are many reasons for keeping some classes of knowledge in the public domain. The solution to this problem is to be found in the establishment of a public agency. The agency could decide to buy knowledge for the public's use when it seems warranted. *Dominique Foray* mentioned *Daguerre*, the inventor of photography as a historical example, whose invention would not have fetched a buyer at his price if the French state had not decided to buy it. Thus photography became public property and conquered the world. There are seminal inventions today that have extraordinary social returns, yet are not implemented and exploited by private capital. In these cases, the state should intervene to propagate the diffusion of knowledge.

The point-of-view that in developed countries, knowledge cannot be merely the affair of individuals and companies was put forth in many other discussions of the Workshop as well. Obviously, the state also needs to take part in building a knowledge-based economy. Their role, as *István Fodor* emphasized it in the debate after his presentation, is not primarily that of financing knowledge-production. It is more important that they act as coordinators or mediators, fulfilling tasks of marketing "local competence" and promoting local knowledge to the companies that are the centers of knowledge-production and to other countries.

Philip Shapira also set the role of the state as a "facilitator-helper," and - using a US case as an example - analyzed the impact of explicit public policies and programs on promoting inter-firm knowledge-transfer and networking. The logic of policy for the development of inter-firm promotion initiatives - as *Philip Shapira* formulated it - revolves around *three inter-linked notions*. The *first* is that firms engaged in inter-firm collaboration and networking are typically more innovative and more successful than the less interactive firms. The *second* idea is that intermediary organizations and infrastructures, including network groups, industrial associations, business organizations, research centers and educational institutes, can perform critical roles in facilitating inter-firm collaboration. Finally, public policy can strengthen industry and organizational attitudes and capabilities related to inter-firm collaboration. One recent policy initiative to promote inter-firm collaborative capabilities in the United States is USNet.²⁸ In its initial proposal, USNet

²⁸ This pilot program was comprised of a consortium of state-based manufacturing assistance organizations (or "partners"), along with the Manufacturing Extension Partnership (MEP) of the National Institute of Standards and Technology (NIST) in the United States Department of Commerce. Federal sponsorship for USNet was provided under the US Technology Reinvestment Project (TRP). Federal funds were matched by state and local funds and in-kind contributions provided by each partner.

sought to provide six specific types of services to upgrade state capacities to promote *inter-firm collaboration; technical assistance, training, the development of learning groups, information and resources, assessment tools and performance metrics and assistance with international connections*. USNet established a parallel evaluation element, too.²⁹ The most important finding of the evaluation is a definite positive correlation between the inter-firm networks and the net benefit of the participating firms. At the same time it has also been proved that the original goals of USNet were too ambitious in proportion to available resources. There are also further statements originating from the evaluation. There's no doubt that the training programs of USNet have generated a widespread awareness of inter-firm collaboration. It was also pointed out that the USNet special projects demonstrated the value of explicit follow-on. Unfortunately, USNet policy and organizational impact at the state level were rather modest according to evaluators. Federal support can strengthen efforts to promote inter-firm collaboration at the state level and aid shared learning.

The debate produced questions on what motivates companies to participate in projects like USNet. According to *Philip Shapira*, there are several motivating factors, one of them is the need of battling isolation. The companies that feel isolated gladly join network projects. Also, due to the destruction of heavy industries, whole regions have lost their traditional markets, and these hope to find new opportunities and new markets in joining networks. According to Philip Shapira, the adhesive force of networks is always linked to the participants *having unsolved problems* that they think more easily solvable in a network than independently. For example, the small and medium-sized companies concentrated in *USNet* and similar networks would not be able to solve their training problems independently. They need the background of a network to find a solution to this as well as environmental and other problems.

Katalin Szabó directed the attention to a contradiction linked to *Philip Shapira* presentation. The presenter mentioned the fact that the prerequisite of cooperating in networks like USNet is trust. Yet, trust between partners only develops during long-term cooperation, in a "multi-stage" game, while these networks came into being with the aim of making the participants' reactions faster. Trust needs time, but the speed of reactions required by technology and the market do not give the companies enough time. They have to act fast and decide to co-operate fast if they want to remain competitive. *Tamás Fleischer* (Institute of World Economy, Budapest) approached the inherent conflict of trust and flexible reactions from a different angle. In his view, trust in networks is mostly significant when the network is being developed, which does take a long time. Flexibility and quick reactions, however, are not important in this phase, and they only become a critical factor in the operational phase of networks. Consequently, according to the contributor, the conflict between trust and fast reactions is only paradoxical. However, *Philip Shapira* voiced his opinion that the conflict between the time-requirements of trust and the required reaction-speed is not merely a superficial contradiction. Nonetheless, this contradiction can - even if it is not simple or easy to do - be resolved in network practice.

²⁹ As part of this multiple-approach, the USNet evaluation effort was structured around three themes: 1) the effectiveness of USNet activities and services; 2) the impact on partner capabilities, services and policies.3) the impact on collaborating small and mid-size firms.

In the debate, *Tamás Balogh* (OMFB - National Committee for Technological Development), asked how USNet supports networking. With grants? Credit? Technical aid? *Philip Shapira* replied that all of these were utilized to promote the development of networks, but he saw brokering as the main instrument of doing so, not direct aid. Thus, the participants of networks do not rely only upon support, but attempt to draw in private resources to finance their projects. He also finds it very important that aid is never directed towards the general aim of developing networks, but always given for a *concrete goal*, e.g. training. In addition, if the aims are not fulfilled, support can be withdrawn.

Tamás Balogh approved of *Philip Shapira's* approach to evaluating networks, as it does not restrict itself to a cost-benefit analysis, but extends to include feedback from the participants and various performance indicators. The opinion that network has become an indefinite concept to describe highly dissimilar phenomena also came up in the debate. In reaction to this, *Katalin Szabó*, while admitting the prolific overuse of the term and the discrepancies inherent in unclear terminology, underlined that network is nonetheless more than a fashionable yet meaningless word. There are two important changes behind the appearance and spreading of the term. In the first place, networks, as opposed to the turn-of-the-century cartels and former formations, reach the "heart" of companies and effect fundamental competencies. Secondly, networks dissolve company boundaries, which makes telling where one company ends and the other begins virtually impossible.³⁰

The last presentation of the Workshop also analyzed the role of the state, through portraying the role of private-public partnerships (from now on ppp) in developing regional information resources. The speaker, *Wolfgang Gerstlberger* based his presentation on the notion that neither private, nor public local organizations can build up sufficient regional information resources unallied. An institutional co-operation between regional public and private organizations (cities, universities, chambers of commerce, unions, etc.) is in the long run necessary to participate in a globalized economy successfully. In his paper, *Gerstlberger* presents several characteristic cases of advanced partnership in various Western countries. (e.g. Media-Park Cologne, Regenerating South Yorkshire, One-Stop-Agencies in Sweden, Telecommunications in North Carolina, Technology Park Sophia-Antipolis, Cop van Zuid in Rotterdam, Urban Renewal in Jaroslawl, New Airport in Athens, Seville's Cartuja'93, Science Castle in Tsukuba, New Potsdamer Platz in Berlin etc.) The "innovative milieu" in these parks has an important potential effect on the long-term development of regional or even national economies. Beside shared financial risk, public-private-partnerships have advantages which result from the coupling of different types of knowledge resources. These advantages are the following:

Public-private joint ventures make it possible to recruit staff from the private sector who have special economical or technical know-how. Affected citizens or customers can be integrated more easily in public-private communication networks than in the everyday work of purely public or purely private organizations. Therefore suggestions and critical remarks external to everyday information routines are accepted more easily. For the private partners in ppp-s, political and administrative procedures are less difficult to conduct because of the special knowledge the public side has in this field. Many regional or local chambers of commerce, universities or public banks (for example the German

³⁰ Many consider consumers part of the circle of companies as they have a principal role in the improvement of products

"Sparkassen") help financing public-private-partnerships. The main reason for this engagement is "half-public" organizations' growing dependence on the economic development of regions and cities. In the European Community (EC), many national states and some federal states (for example the German "Länder") work with development funds which support regional public-private joint ventures as high priority projects. *Wolfgang Gerstlberger* also treated the other side of the ppp-s and elaborated on their disadvantages, e.g. the difficulties in exchanging information, different "professional cultures", the local politicians' loss of influence, the absence of a wider political support-network, lack of concrete goals and the long-term dependence on governmental development funds. Despite the obvious problems with public-private cooperation - summarizing their analysis by the presenter - the successful development of regional knowledge transfer cannot be done without such organizations.

Among others, the problem of obtaining information in ppp-s arose during the debate following *Wolfgang Gerstlberger's* presentation. In answer to *Philip Shapira's* question, the presenter voiced his opinion that the main question of ppp-s in this department is the problem of balancing flexibility and community control. He opined that this problem is more urgent in Anglo-Saxon countries, where control-mechanisms do not function as well as in the case of the Netherlands or Germany. However, he admitted that there are problems intrinsic to strong control as well, such as congealing ppp-s and hindering flexibility.

A contributor reflected on the fact that the ppp-s originating in the polytechnical colleges of new German states are often more successful than those from old states. In his reply, *Wolfgang Gerstlberger* contributed this to the greater degree of openness towards private ventures in the institutes of new states, as they are themselves newly formed and forming institutions.

The closing discussion

In the general debate closing the one-and-a-half day workshop, the chairman, *Stefan Kuhlmann* formulated two questions which might effect the later work of the Six Countries Program. 1) Is knowledge-transfer, the main topic of the Workshop, merely a 'hip' topic, or is it genuinely relevant to the future? Thought-provoking observations were formulated in relevance to the question during the debate. *Philip Shapira* commented that there is something to do with 'hip' in the fact that Information Society is the constant topic of debates while the 60% of the world's population who have never seen a telephone are simply forgotten about. *Gerry Sweeney* warned us to avoid exaggerations connected to high-tech industries, e.g. the fact that most high-tech industries require a low level of skill from their workers is not emphasized enough. However, *Dominique Foray* commented in a later part of the debate that the so-called low-tech industries also require high level skills as its knowledge-requirements change as fast as the high-tech industries'.

Stefan Kuhlmann's second question addressed the role of the state and public policy in knowledge-transfer. Does public policy have an authentic role in these processes and if yes, what does it consist of? Does politics play the role of a regulator, a mediator, or an evaluator, and how could we define this role better? The contributors to the debate recommended the way the Six Countries Program does not lock itself into an ivory tower,

and the presenters and discussants attempt to deal with political recommendations. A contributor reminded us of the thought that was broached many times during the debate, and played a central role in *Philip Shapira's* presentation, i.e. that the Information Age brings significant changes in this department as well, since the major trends are ones of decentralization and increasing flexibility. Therefore, policy makers should make deliberate efforts to concentrate on education as the instrument of preparing the new generations for dealing with the Information Age. This demand was formulated a long time ago, yet, as we can see, it is far from being completely realized. In a turbulently changing world, education remains affixed to long-gone structures, and this is the responsibility of policy-makers as the representatives of education. It was commented that some distinction should be made between educational institutions, i.e. while primary education and universities are resiliently reacting to new requirements, secondary education is hopelessly rigid.

According to *Stefan Kuhlmann*, in a knowledge-based economy, companies provide the special knowledge their employees need and only expect the general basics from education. It was also said in the debate that the different actors of knowledge-creation and knowledge-transfer are increasingly difficult to differentiate, as the representatives of the public, the state or educational institutions have to accommodate themselves to market-oriented concepts. *Gunnar Eliasson* reflected that the companies themselves do not really know what they expect from their employees, it is more in the nature of an experiment than having certain knowledge about the topic. This thought was widely accepted amongst the participants, and a contributor brought up the USNet example in connection to it. At USNet, several methods and forms of support were tested, then, after careful consideration, they chose the one that seemed most likely to succeed. Experimentation is needed everywhere, but principally in educating the next generations. After all, education is the industry of the future, and we can hardly know our future. *Katalin Szabó* supported the necessity for experimentation as well, demarcating two reasons why companies cannot expect fully prepared employees with finished knowledge from universities and other institutions. One of these is the existence of the so-called learning companies or the connected phenomenon of life-long learning. Companies do not expect to receive finished products from schools, but semi-finished products ready for customization during work to accommodate to the needs of the company. The other reason that makes the formulation of companies' requirements of the education system difficult if not impossible is that the companies do not know which education system to present their requirements to. Due to globalization, the world-market for professionals is developing, but there is nothing to guarantee that the Swedish company can only put forward its requirements to the Swedish system while the American can only do so to the American one.

In his closing words, *András Siegler*, the host of the conference, emphasized the fact that the topics broached at the Budapest Workshop of the Six Countries Program, e.g. knowledge-creation, knowledge-transfer are "amongst the hottest issues for Hungary." Unfortunately, it cannot be said that everyone recognized their true importance. The question of what should be taught in schools, the topic of the last day, was also deemed singularly important by him. *András Siegler* closed the conference by presenting the agenda of the next Six Countries Programme, to be held in Scotland, remarking that the

Scottish conference on services will be an unequivocal continuation of the Budapest Workshop.

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Industrial Development in the Knowledge Based Information Economy: A Competence Bloc Analysis

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Europe's Way Towards the Information Society: Current Initiatives and Activities – an Information Pool

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Abstract

Information and communication technologies and services are not only causing an industrial revolution based on information but are also decisively shaping the future of society as a whole. The G7 and the European Commission have initiated several activities that aim at smoothing the way towards an Information Society. This paper looks at some of the actions and in particular at ways that have been started to diffuse know-how and knowledge within the EU and internationally. The Internet plays an increasingly important role in the global transfer of information. This development is especially important for information pools on Information Society relevant themes that have been created for the dissemination of knowledge and know-how by national and international bodies. Two major information pools – one set up by the G7, the other by the EC – are presented and their respective missions described. Brief examples of the type of information available from one of the pools concludes the paper.

Introduction

It is generally understood that information and communication technologies and services are not only causing an industrial revolution based on information and being of an unforeseeable dimension, but are also decisively shaping the future of society as a whole. There have never before in the history of mankind been such rapid advances in technology leading to new applications and markets. The diffusion of these new technologies at all levels of economic and social life is thus gradually transforming our society into what is often called the Information Society (IS)¹. This expression reflects the European concern with the broader social and organisational changes which will arise from the information and communications revolution.

This paper will first present an overview of the major concepts and activities of the European Commission and the G7 in their goal of preparing the way for their societies to move towards the IS. A more detailed description of some important information pools that have been (or are being) established to support this transition follows. Examples from such an information pool will conclude the paper. It will be seen that there is a general trend to utilise the Internet as an essential infrastructure to diffuse information and to some degree transfer know-how and knowledge.

Major Activities of the European Community

The preparatory work of the European Community for Europe's move towards an Information Society originated in the beginning of the eighties when major research & development programmes on information technologies such as the ESPRIT programme (1984), the RACE programme (1985) on advanced communication, and the first three programmes on telematic applications (1986) - AIM (health care), DRIVE (road transport)

and DELTA (distance learning) - were started. All these programmes have been extended in the 4th RDT framework programme.

The Bangemann report² which contained recommendations for actions to the European Council triggered numerous activities on the Information Society by the EC. Presented in May of 1994 it stressed the importance of a capable infrastructure by strengthening existing networks and accelerating the creation of new ones. Ten applications were defined in the report to launch the Information Society. They were thought of as steps for 'blazing' Europe's way to the IS.

One of the activities triggered by the Bangemann report was the so-called Global Bangemann Challenge. It initially ran from 1995-1996 as a European project. Its main goal was to motivate cities in taking advantage of the opportunities information technology offered to communities and its citizens. The sharing of knowledge and experience is a central issue and it will be supported by the interactive web site of the Global Bangemann Challenge. The City of Stockholm has taken over as the successor to the Bangemann Challenge which is now addressing cities all over the world to participate. This international project offers on the one hand an excellent channel for cities and regions to market their IS projects and on the other hand for less advanced cities and regions to learn from the experience of others. The participating projects are to demonstrate how technology can be applied in the best interest of people and society all over the world. The eleven different project categories range from life long learning, healthcare and culture to e-commerce. 486 projects of 260 cities from 65 countries have been registered so far.

In December 1994 the Information Society Project Office (ISPO) was initiated by the Commission. ISPO's function is to inform companies, organisations, and individuals on the European Commission's many programmes and initiatives aimed at ensuring a smooth transition to the Information Society. ISPO is also acting as a promoter of awareness and a broker of ideas, with the objective of stimulating the creation of partnerships and real life applications, demonstration of best practice and launch of international co-operation initiatives. Its aim is to bring the expertise and the capabilities of the Commission in this field much closer to the European public.

G7 Activities

In addition to numerous national programmes and initiatives in countries such as Canada, the USA, and Japan, the G7 members along with the European Commission identified a number of selected projects where international co-operation could be an asset for the move towards an Information Society at the Ministerial Conference held in BRUSSELS in February 1995. These projects should aim at demonstrating the potential of the Information Society and were expected to stimulate its deployment. Initially these projects were expected to be undertaken by G7 member countries but were intended to be open to participants from other countries and international organisations. The work undertaken in the G7 Pilot Projects is based on joint deliberations and consensus on 'Theme Areas' that were identified to be of common international interest for the Information Society. These selected themes were then rendered into more concrete project proposals through formal and informal discussions and meetings.

The key objectives for the launching of G7 pilot projects for the Information Society have been:

- to support the goal of international consensus on common principles governing the need of access to networks and applications and their interoperability,
- to establish the groundwork for productive forms of co-operation amongst the G7 partners in order to create a critical mass to address this global issue,
- to create an opportunity for information exchange leading towards the further development of the information society,
- to identify and select projects of an exemplary nature having tangible and clearly understandable social, economic and cultural benefits which will demonstrate the potential of the information society to the public,
- to identify obstacles related to the implementation of practical applications serving the creation of a global information society,
- to help to create markets for new products and services, where appropriate.

The following main principles guided the selection and implementation of the theme projects:

A clear added-value for the development of the Information Society by:

- improving the effectiveness of information exchange,
- providing a forum for the comparison of experiences,
- launching common actions, and
- initiating co-operation at a global level.
- Providing meaning and content to the concept of the Information Society for all citizens, taking into account their cultural diversity.
- Stimulation of co-operation amongst different players: industry, academia, administrations, public authorities, etc.
- Avoiding the creation of new bureaucracy or unnecessary institutions.
- Any arising expenses should in general be covered by existing programmes.
- Open access should be an integral part of its design.
- Projects will be open to non-G7 countries as well as to public and private organisations, including international organisations and standardisation bodies.

Eleven project themes have been selected for initial implementation in pilot projects. Other areas of common economic and social concern, such as applications for elderly and disabled persons, are being pursued and opportunities for other co-operative projects studied. The eleven pilot projects are:

Global Inventory Project (GIP) - A pool of information on approximately 2 000 projects and studies on the development of the global information society. This project is being considered to be one of the major IS information pools and is therefore described in more detail below.

Global Interoperability for Broadband Networks (GBIN) - Promoting the linking of high-performance networks and encouraging the development of services to make the most of this information super-highway. The project tests technologies and stimulates awareness through 19 advanced applications.

Trans-Cultural Education and Training for Language Learning (Tel*Lingua) - An international network for language education, with a prototype system to link teachers, trainers, and users.

Electronic Libraries (Bibliotheca Universalis) - Establishing how information, already available in digital form, can be made globally accessible, leading to a co-operation agreement between national libraries.

Multimedia Access to World Cultural Heritage - An up-to-date inventory of heritage information with work focusing on implementing a Memorandum of Understanding for the development of services and the dissemination of information and media.

Environment and Natural Resources Management (ENRM) - Concentrating on improving the quality and quantity of information on climate change and biological diversity. An experiment in linking networks internationally has led to a standard for more easily locating information sources on global networks.

Global Emergency Management Information Network Initiative: GEMINI - How a global emergency information and management network might be set up and operated. Twenty-eight demonstration projects covering networks, support functions and specific hazards.

Global Healthcare Applications - System demonstrations for the way medical images and health cards can be used internationally, remote second opinions in the diagnosis of cancer, and remote treatment of patients with heart disease.

Government On-Line (GOL) - This project promotes and publicises the ways in which Governments provide information and services on-line to their citizens, sharing information between countries, and developing a common strategy.

Global Marketplace for Small and Medium-Sized Enterprises - A network of business information on the Web and a best-practice guide on electronic commerce for smaller companies. Some 30 international pilot projects on electronic commerce have received the G8 seal of approval.

Maritime Information Society (MARIS) - Linking existing systems to provide global maritime networks, with information ranging from continuously updated fish market data to engineering and procurement networks.

Information Pools

Today information on activities on the Information Society in Europe and beyond is made available via the Internet from many sources. The focus in this paper will be on two information pools which contain a broad scope of information covering many aspects of the Information Society. These major sources for information are:

The Global Inventory Project (GIP)□ contains information about projects, studies, etc. underpinning the development of the information society. It builds upon and complements on-going national and international initiatives.

The European Survey of the Information Society (ESIS) Project□ was launched by the Information Society Project Office in 1997. It has set up a database based on an inventory of Information Society projects and actions in each of the 15 countries of the EU.

At the moment the scope of the ESIS project is limited to countries of the EU. There has been a call for tender with the goal to extend the inventory to IS developments in the CEEC and Mediterranean countries starting in 1999. In comparison the GIP database contains information on projects world-wide.

Global Inventory Project (GIP)

The GIP has been launched by the G7 and is led by the European Commission and Japan. It is hosted in Brussels by the European Commission's Information Society Project Office. For GIP a decentralised approach was taken using the information access properties of the World Wide Web. Each participating country is identifying and collecting projects relating to the Information Society.

A number of selection criteria were defined to be used for the identification of Information Society relevant projects and activities. Thus projects should meet criteria such as:

- to address current Information Society issues,
- to describe original, transferable solutions that add value to similar initiatives carried out by other countries,
- to be of interest and of use to businesses, in particular SMEs,
- to illustrate innovative information technologies and best practices,
- to enhance the development of value added services,
- to be significant from an educational and training point of view, and
- to foster research and development geared towards the advancement of the Information Society.

The overall goal of the GIP project is to produce an Internet-based multimedia inventory of national and international projects, studies and other initiatives pertaining to the Information Society. Its main objectives are:

- to act as an international point of reference which will assist in the promotion of the Information Society,
- to establish a network for the free exchange of information about national and international initiatives relating to the Information Society (electronic forum),
- to promote and gain understanding of the impact of Information Society activity on the economy, industry, and society,
- to foster international alliance building and multinational projects and investments.

With an initial scope covering the European Union and the G-7 countries projects from non-G7 countries (especially within developing countries and countries in transition) are also welcome. Each participating nation can either use their own server or the GIP host. The individual databases will be indexed and provided with search capabilities. A search engine implemented at the GIP host today indexes about 2000 projects and offers a multi-lingual interface.

Today the basic information pool consists of eight nations (Canada, France, Germany, Great Britain, Italy, Japan, Rep. of Korea, Switzerland, USA). In addition the GIP database includes miscellaneous self-registered projects of another 12 countries.

The user interface is available in English, French, German, Italian, Japanese, Spanish, Portuguese, and Arabic. A catalogue provides access to about 200 other IS related initiatives. Self-registration of individual isolated projects is also supported. Links exist to the other G8 IS pilot projects and a 'who's who' of participating bodies and countries. Other sections present GIP awareness activities, newsletters, and online tools, including access to EC/ISPO help desk via web telephony.

National web sites have also been established by the G7 countries. Their mission is to provide comprehensive information on IS activities at the national level. The current state of these activities varies from country to country. Some sites are completely operational and contain extensive lists of projects, initiatives, IS relevant documentation, as well as news clips and current events. Others are still in a developing state with no or very limited information or material.

The European Survey of the Information Society (ESIS) Project

ESIS holds information on a broad range of commercial and publicly funded Information Society application projects in Europe as well as other IS relevant information. It aims at providing a tool for knowledge, communication, partnership, and the promotion of best practice examples. Furthermore, it can serve as a navigation tool for all key actors and help in the promotion of the Information Society in Europe. Co-ordinated input for the ESIS information pool is provided by twelve organisation, each responsible for one or more member states of the EU. For Germany this task is taken up by the FhG-ISI.

ESIS combines four categories of information:

- An inventory of projects being the core of ESIS is performed on the basis of a standardised questionnaire. Projects must meet a set of criteria in order to qualify as an IS project.
- A summary and analysis of new regulations and a collection of basic facts on Information Society developments with regular updates.
- An up-to-date overview of public and private promotional actions and initiatives aimed at favouring the development of the Information Society.
- A mapping of the relevant actors, notably the public or private network facilities offering Information Society infrastructures, services and applications.

Currently the ESIS database contains relevant data on more than 1600 projects from the 15 member states of the EU. This data can be accessed directly using a standard web browser (see below). In addition more than 900 promotional activities have been indexed by the ESIS network since the start of the ESIS project. These initiatives, programmes, and promotional activities are described in a standardised form. All ESIS information and data are accessible via the Internet at the centralised web site.

Examples from the ESIS Information Pool

Information on more than 1600 national and international (EU wide) projects on IS issues can be obtained directly via the Internet by connecting to the ESIS database. The corresponding web address (URL) is <http://www.ispo.cec.be/esis/>. In addition to IS projects this Web site contains information and newest data on:

- statistics of the database at the EU level,
- a quarterly overview of regulatory developments in the EU Member States,
- a quarterly review of actions and initiatives launched in the EU Member States to stimulate the progress of the IS,
- profiles of alternative network telecom infrastructure and services with potential for use in IS applications,
- figures and trends on IS technologies,
- an overview of recent changes within organisations involved in IS, and
- current news.

The following three examples from the statistical analysis of projects (from all member states) are representative of the type of information that can be gained from the ESIS database. This type of information could be of value to decision makers at the national or EU level when deciding e.g. on new programmes or initiatives for the Information Society. A presentation of these and additional figures is given on the ESIS Web site and can be viewed by anybody using a standard WWW browser^{3,4}.

Application Fields – nine categories were selected to classify the IS projects according to their application fields or areas. Applications in the field of education and training dominate with almost 50 % of the projects reported as being active in this area. Trade and commerce follows with 30 %. This number reflects the current interest in e-commerce.

Application Types – project co-ordinators were asked to indicate which of eight application types would best represent their project. Educational services have been checked most frequently followed by local information and the class of work-sharing and teleworking. As a group the 'tele' types would dominate.

Users Targeted – most projects address with their projects the general public i.e. the domestic consumers represent with 24 % the largest target group. It should be noted that multiple entries were possible for indicating the target groups. Thus it is quite possible that even though the main target is the professional user the results of a project could benefit the general public.

Conclusions

Recent developments in the information and communication technologies (ICT) and services have produced new and far reaching means to globally diffuse information, knowledge, and know-how. This paper has given examples of how new programmes of the G7 and EC concerning Europe's way towards the Information Society have utilised the new ICT to reach a broad audience with their messages. A central theme of these programmes is an awareness campaign on the benefits of the new ICT in view of the Information Society. The Internet and in particular the World Wide Web have been assigned an important role in this development. Without the development of an on-line infrastructure such as the Internet the creation of global information pools and thus the world-wide dissemination of knowledge and know-how would be decisively hindered if not impossible at all.

The paper has presented some background information on G7 and EU activities on the Information Society. Two major information pools have been highlighted which were initiated by the G7 and the EU. They contain broad information on national and international projects, initiatives, and actions concerning the IS. Best practice example from these pools can contribute to the transfer of knowledge.

There exists a certain redundancy between the two information pools described above. However, the focus on the type and extent of information differs significantly. The approaches used for collecting the necessary information also differ considerably. The available ESIS data are more stringently monitored and statistical analyses are part of the

project tasks to obtain a deeper insight into development structures of the involved countries and for the EU as a whole.

Notes

1 In addition to IS the term 'Knowledge Society' is also being used.

2 Europe and the Global Information Society - Recommendations to the European Council (known as the Bangemann Report), European Commission, 1994

3 <http://www.gip.int>

4 <http://www.ispo.cec.be/esis/>

Reinterpretation of Centre-Periphery Relations in the Information Age

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Remark: There is no full paper but since the speaker gave a very interesting oral presentation which initiated fruitful discussions and which is referred in the summary paper many times, the editors decided to include the short abstract prepared by Mr. Pál Tamás in the Proceedings.

1. The core-periphery relations are hierarchical structures of dependency [in some cases of mutual dependency] based on communication patterns embedded into established patterns of the international control and division of labour.
2. Basic scenarios of transformation in the research system :
 - 2.1. 0, or minimal substantial change
 - 2.2. growing fragmentedness of the research landscape in respect of the particular households in different disciplines or subdisciplines
 - 2.3. major substantial change in the social fabric of the research system
3. The basic question in the interpretations: the transformation is only a communication issue or it is a new basic source for restratification of the elites within the research or innovation systems?
4. Elite configurations [role sets] in the research system
 - 4.1. Elite Formation
 - [a] positional
 - [b] functional
 - 4.2. Knowledge Production
 - [c] local
 - [d] cosmopolitan
5. Cultural frames: control mechanisms of the core on the periphery

	High culture	Low culture
Premodern:	+	-
Modern:	+	+
Postmodern:	-	+

6. Changes of the elite strategies.

From Passive into Active Networking

Reformulation of the filter [gatekeeper] function of the elites

Model of the elite formation and knowledge production

Elite formation:

Local

Cosmopolitan

Positional

Elephant

Giraffe

Functional

Swallow

Eagle

	National networks				International networks			
	active		passive		active		Passive	
	pre	post	pre	post	pre	post	pre	post
Elephant	+/-	+	++	++	0	+/-	+/-	+/-
Giraffe	0	+/-	+	++	+/-	+	+	+
Swallow	+	++	+	+	0	+/-	+/-	+
Eagle	+/-	+	0	0	+	++	++	+

Terminology infrastructures and the terminology market in Europe

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Abstract:

There seems to exist a vexing relationship between the possibility to use one's mother-tongue and the positive economic development of the respective language community. People whose mother-tongue is not (or not sufficiently) developed from the point of view of specialized language or who are denied to use their mother-tongue in education and training, for accessing information or in their daily work situation tend to be/feel disadvantaged. In most cases the limitation of the use of a language to areas such as culture and folklore results in the - almost irreversible - loss of its applicability in specialized communication. On the one hand, the 'linguistic map' of Europe reveals the richness of the European cultural heritage, but should not, on the other hand, be a source for complacency, if we consider the potential for conflict. It definitely needs a framework of measures at European, national and language community level in order to prevent the smaller language communities from dropping into a really disadvantaged situation.

The terminology infrastructure(s) as well as the terminology market(s) are still characterized by the co-existence of many loosely interconnected elements. Of course there are very different language situations within the various language communities with respect to the evolution of terminology infrastructures and the terminology market. Nevertheless a certain pattern seems to evolve. First of all a distinction has to be made between the horizontal and vertical infrastructures. In the area of the horizontal infrastructures five main structural elements seem to crystallize out of the dawn: terminology (planning) policy, terminology creation centres, terminology information and documentation centres, terminology associations and corporate cooperation groups led by the private sector. Definitely the development of the terminology market and the development of a terminology infrastructure mutually support each other. Obviously the development of both is speeding up recently, but there is still a long way to go.

The planned European Network of Terminology Documentation Centres (TDCnet) will be a cornerstone of the future terminology infrastructures in Europe. It will also support the further development of the terminology market by providing information on existing terminology resources, activities, experiences, services etc. and on the conditions of their availability.

The fundamental role of Terminology

Where and whenever specialized information and specialized knowledge are being prepared, represented, processed, transformed and transferred, terminology is accorded a crucial role. There is, therefore, hardly any area in an enterprise or other specialized organization, where terminology is not used.

1. Lack of awareness and fragmented situation

On the one hand terminology is of fundamental importance as it represents specialized knowledge at the level of concepts (which are the basic units of subject-field related thinking/cognition, knowledge and communication), so that terminological data are the main 'contents carriers' to record, order, store, manage, represent, retrieve, disseminate, communicate or transfer specialized information and knowledge. On the other hand there is comparatively little awareness for this importance even in the quarters of the specialists being the primary creators and users of the terminology of their respective subject-fields.

This is partly due to the fact that terminologies are created as a rule by domain experts of various levels in a multitude of subject-fields in an 'evolutionary' rather than coordinated way. This results in a highly fragmented and sectorized situation with respect to most terminological activities and applications. The emergence of a terminology market for terminological products and services will certainly improve this situation, but it also needs terminology infrastructures to support the creation and distribution, re-use and use of terminologies - especially in multilingual and multicultural Europe.

1.1 Economic and social impact of mother-tongue use

There seems to exist a vexing relationship between the possibility to use one's mother-tongue and the well-being of the respective language community. People whose mother-tongue is not (or not sufficiently) developed from the point of view of specialized language or who are denied to use their mother-tongue in education and training, for accessing information or in their daily work place tend to be/feel disadvantaged. Especially smaller language communities (incl. linguistic minorities of all sorts) have to balance many linguistic disadvantages by making more efforts than the surrounding larger language communities in order to prevent marginalization with respect to scientific-technical and economic-industrial development - which ultimately may lead to socio-economic decline. In most cases the limitation of the use of a language to areas such as culture and folklore results in the - almost irreversible - loss of its applicability in specialized communication. This calls for a distinct consciousness for the need of terminology planning in many/all language communities and concrete legal and administrative action to support it.

1.2 Situation of specialized languages in Europe

In today's European Union (EU) there are only a few language communities whose mother-tongue is discriminated or even suppressed, but many whose language situation can be called disadvantaged for various reasons. An unorthodox analysis of the 'linguistic map' of Europe shows that from the point of view of language variety Western Europe must be considered rather 'poor' compared to other continents. Nevertheless the language distribution is far from being simple and without problems. According to recent figures about 55-60 languages are used as mother-tongue by language communities of more than 50,000 speakers (including non-European languages of foreign workers or refugees, while not taking into account the Caucasus region, which is a linguistic cosmos of its own). If only languages of more than 500,000 mother-tongue speakers are considered, the figure drops to about 45 languages. Some of these language communities do not much care about

specialized languages, matched by a few language communities of sometimes less than 500,000 speakers undertaking serious efforts to develop their language as a tool of modern communication.

In the EU more than 260m citizens use one of the major four languages of more than 50m mother-tongue speakers each: German [90m], English [61m], French [58m] or Italian [55m]. Some 80m people use one of the other 7 official working languages of the EU institutions as mother-tongue: Spanish [25m - if deducting Basque, Catalan and Galician speakers], Dutch [21m], Portuguese [10m], Greek [10m], Swedish [9m], Danish [4m] or Finnish [4m]. Additional 20m EU citizens use one of more than 10 languages with more than 50,000 speakers. Together there are more than 30 officially recognized language communities in the EU, further 10 are seeking official recognition, not to mention all sorts of 'minority languages'. The ratio of small languages to large language communities, therefore, is about 35% (if Spanish and Portuguese in this context are included in the small languages – which can of course be argued). In this connection it is also difficult to evaluate the situation of people speaking a minority language somewhere, which is a large language elsewhere in Europe or in the world. Every further extension of the EU will push the above-mentioned ratio towards less than 35%, which would mean that more than two third of the future EU population will belong to a potentially disadvantaged language community.

Various references consulted with regard to language statistics are by no means consistent. Therefore, individual figures may be questioned, which, however, has no substantial effect on the overall picture presented here. The figures, on the one hand, represent the richness of the European cultural heritage, but should not, on the other hand, be a source for complacency, if we consider the potential for conflict. It definitely needs a framework of measures at European, national and language community level in order to prevent the smaller language communities from dropping into a really disadvantaged situation.

2 The 'Terminology Market'

Not the least due to the European Commission's emphasis on multilingual aspects in all Community R&D Programmes a terminology market - deserving to be called so - is gradually emerging.

2.1 Terminology products and services for whom?

Terminologies emerge among others

- in science and technology in the course of scientific and technical development,
- in crafts and arts in the course of new techniques and skills,
- in public administration and in society in general in conjunction with new conceptions and approaches.

They are created primarily by domain experts of various levels in a multitude of subject-fields in an 'evolutionary' rather than coordinated way. The expert communities, comprising the primary creators and users of their domain specific terminologies, thus

also cause the well-known communication problems, such as homonymy and synonymy, which some of them try to figure out by means of descriptive or prescriptive terminology work. Terminology work, therefore, is carried out in a large number of subject fields usually by groups of experts. In addition, it should be remembered that it is a time-honoured scientific tradition to define what one is talking about in scientific and technical texts (a general rule for instance in standardization) – a good tradition often neglected today in scientific discourse.

Since science and technology increasingly influence more and more all walks of life and society, deficient terminologies are not only causing communication difficulties in the respective peer groups, but also have negative repercussions on many people who have to use specialized terminology

- at their work places,
- as consumers,
- as citizens, and

more and more even in intra-family communication. Potentially and increasingly everybody is or could become a more or less frequent user of some or any specialized terminology regularly or occasionally in his/her life.

The gradually emerging ‘terminology market’ will offer terminological products and services - which in fact are a particular family of information products and services - to a variety of consumers and clients, such as

- terminology creators (e.g. researchers, technicians, administrators, etc.),
- terminology data producers (e.g. terminology database creators, specialized lexicographers, etc.),
- terminology data distributors (e.g. dictionary publishers, online information services, etc.) and
- terminology users in general.

Terminology creators, data producers and data distributors in most or many cases are also or can become re-users of existing terminological data.

2.2 Terminology products

Terminology products mainly comprise

- different kinds of terminological information in different forms for different purposes and different user groups,
- terminological tools for various purposes.

Terminological information (if terminology documentation is included) comprise three distinct fundamental types of data, viz.:

- terminological data proper (i.e. information on domain-specific concepts and their representation by linguistic and non-linguistic symbols supplemented by a variety of associated data),
- bibliographic data on a variety of different kinds of publications in the field of terminology,

- factual data on institutions, experts, programmes, events and other activities in the field of terminology.

Each of them requires a different type of database system (comprising a set of distinct databases each for different data models). A comprehensive terminology information and documentation centre like Infoterm has to deal with all three types of database systems modelled on the basis of well-defined data categories (according to the 'objects') for different purposes. The data as well as the respective software can be used as 'products' and as a basis for a variety of 'services'.

The volume of the above-mentioned types and categories of data may be estimated as follows:

- terminological data proper - about 50m records across all subject-fields (potentially in some 200 languages which are of relevance or potential relevance in terminology) – the increase is more or less parallel to the increase of specialized knowledge,
- bibliographic data - about a quarter million records (of which an estimated 200.000 are about technical dictionaries and lexicons) - the annual increase can be estimated about 10%,
- factual data - about 50.000 records (80% of which concern terminology committees, commissions and working groups as well as terminological institutions at international, regional and national levels) – the increase is difficult to estimate, but the biggest problem here is the high degree of fluctuation!

Terminological data proper

Terminological data can be offered

- in conventionally published form,
- as an electronic publication (only data as such in a given format or in combination with a software or hardware, such as in an electronic dictionary)
- through online information services.

In palm-top computers or smaller pocket-size dictionaries the terminological data may be implemented in inseparable combination/integration with the respective software or even hardware.

Terminological data can be acquired by customers on the terminology market for internal use only or for re-use, in the course of terminology data interchange, etc. on a variety of different data carriers (diskette, CD-ROM, etc.). However, different user groups need terminological data of different degrees of complexity and granularity for different purposes.

It is, therefore, highly economical to prepare multi-purpose terminological data for different purposes and users, whose needs are taken care of by appropriately tailored customer-specific user-interfaces. Terminological data can also be used very efficiently as the intellectual 'skeleton' (or infrastructure) around which the contents of domain-specific encyclopedia can be organized.

Terminological tools

Terminology application software provides the most common tools for the handling of terminological data in some way or other. **Terminology management systems** (TMS) are designed as dedicated tools to record, store, process and output terminological data in a professional manner. There are different kinds of TMS for different purposes. **Terminology databases** consist of terminological data and a TMS to handle these data. **Terminology data banks** (TDB) are more or less sophisticated organizational/institutional structures established for the handling and maintenance of terminological data with the help of a TMS. TDBs can comprise several or many terminology databases.

TDBs are supported by a TMS often running on a mainframe, mini-computer or workstation, whereas most of the PC-based TMS today are applied by individual users, small co-operatives (integrated or not by an appropriate LAN), or larger departments (where the individual work-places are usually linked by a more or less sophisticated LAN). On the one hand TMSs are increasingly further developed into tools for various applications, such as

- computer-assisted translation,
- scientific and technical authoring (incl. technical documentation),
- spare-part administration,
- electronic commerce, etc.

On the other hand TMS modules of varying degree of sophistication are implemented into all kinds of application software. They are thus increasingly applied in a variety of information and communication workflows. In the future appropriately designed TMS or TMS modules will find new markets particularly in applications, such as

- co-operative writing (today a high percentage of the citizenship of developed countries works more or less intensively in some form or other as ‘technical writers’),
- documentation (in the meaning of information & documentation as well as of archiving and filing), and
- co-operative terminology work.

If appropriate tools were available for computer-assisted terminology work, the preparation, processing and maintenance of terminological data could be carried out faster, more efficiently and in line with modern quality management approaches. Needless to say that this would considerably help the terminology market to develop.

2.3 Terminology services

At present the following terminology services already exist or are foreseeable in the future:

- terminology consultancy and training services,
- outsourcing of terminological tasks,
- information services.

Consultancy services and training

Consultancy services and training are most often needed in conjunction with application aspects, such as

- application of terminological principles and methods (including especially the appropriate application of existing standards),
- selection and application of tools,
- terminology project management etc.

As a rule today's experts have not studied the basic theory of logic and epistemology underlying the science of sciences (or science theory – also comprising the basic theory of terminology). They, therefore, often need training in the theoretical and methodological basics of terminology science and terminography. Large organizations/institutions often need to include terminological methods and tools into their information management or quality management schemes. Government agencies and other public authorities in many countries want to implement knowledge transfer policies, which would largely benefit from the appropriate terminology planning methods. Institutions and organizations frequently also need advice with respect to legal problems (especially related to intellectual property rights) concerning the application of terminological data and tools.

It has to be mentioned, however, that with a few exceptions (e.g. China, Greece, etc.) these needs are still latent, decision makers not being aware of the usefulness and effectiveness of such services. Therefore, it is still a dormant market for lack of interest and investment.

Outsourcing

Increasingly institutions and organisations of all sorts consider outsourcing a suitable method to cope with identified limited terminological needs. Outsourcing may refer for instance to

- **research and development on demand** concerning new tools or applications, adaptation of existing tools etc., such as
 - TMS or even TDB design and implementation,
 - meta-browsers for information networks, etc.
- **terminology work on demand** with respect to
 - terminology preparation,
 - terminology maintenance (including among others revision and updating),
 - conversion or merging of terminological data,
 - evaluation and validation of terminological data, etc.
- **maintenance and aftercare services** with regard to
 - TMS software maintenance and upgrading,
 - comprehensive data holdings maintenance, etc.

Information services

Increasingly terminological products and services will - similar to the general situation in the field of information and communication technology (ICT) - be available as one or attached to one of many kinds of information services available on the market. They will also increasingly be integrated into other ICT applications.

For the distribution of terminological data to different user groups with various user needs efforts should be made to establish market-oriented and fee-based information networks for providing

- terminological data proper as well as
 - value-added terminological products and services
- on a commercial basis.

The clients thus will have to pay for terminological products and services. The more clients can choose among an ever increasing variety of terminological products and services the more affordable they will become.

3 The terminology infrastructures in Europe

Given the amount of terminological entries across science and technology and other subject-fields to be prepared in a multitude of languages this monumental task cannot be performed without the help of millions of experts who need to do this anyhow, if they want to work and communicate efficiently. In most cases today such terminology work is carried out in the form of thousands of small co-operative efforts scattered all across the globe and in many subject-fields with little inter-connection. It is performed as a rule in a non-commercial (let alone non-profit) framework.

In some cases terminological activities are carried out 'horizontally', i.e. across many or all subject-fields at the language level. In many or most cases, however, they are carried out 'vertically', i.e. within a given subject-(sub)field. In smaller language communities (or even larger language communities, which feel 'threatened' for some reason or other) the share of horizontal terminological activities/efforts will probably be bigger than in larger language communities with many developed specialized languages. In every language community it requires a public or semi-public or at least partly public infrastructure

- to promote, organize and co-ordinate terminological activities by domain experts taking into account multiple user needs,
- to provide the information on terminological activities, institutions, publications and services available,
- to promote co-operation and co-ordinate activities in order to find solutions to common problems.

The future horizontal terminology infrastructure is composed of five main structural elements or aspects:

- terminology (planning) policy,
- (systematic) terminology creation,
- information and documentation in the field of terminology,
- terminology associations (primarily for individuals),
- purpose-oriented co-operation groupings in private industry or between private industry and public institutions (for the sake of creating and/or sharing terminological

data). Often two or more of these elements/aspects can or will be combined, in many cases they are or should be institutionalized in order to be effective.

3.1 Terminology policy

While terminology planning in large language communities would concentrate on the unification and harmonization of terminology usage, it would primarily focus on the conscious and purposive development of specialized languages in the smaller language communities. Of course differences in the level of development of specialized languages in different subject-fields have to be taken into account. The experiences with and results of existing terminology unification and harmonization efforts (not only at international level, but also in small language communities, such as Iceland) as well as the efforts of the International Information Centre for Terminology (Infoterm), the International Network for Terminology (TermNet), the Association for Terminology and Knowledge Transfer (GTW) and the International Institute for Terminology Research (IITF), and - last but not least - the results of the work of the Technical Committee ISO/TC 37 "Terminology (principles and co-ordination)" of the International Organization for Standardization (ISO) – not to mention other terminology institutions and organizations which exist since many years – are of particularly value for the development of specialized languages and terminologies in smaller language communities whether in Europe or world-wide.

In some countries or language communities it may necessitate the establishment of a political or administrative institution or a consultative council for designing and implementing a terminology policy. Given the linguistic situation in Europe there should be a terminology policy in any case in every language community that wants to develop its language according to the needs of professional communication. Therefore, the author would like to call for a declared European terminology policy on behalf of the European Union with complementary policies at national or language community level in order to take the specific linguistic situation of every language community into account. These policies must, however, be supported by efforts from within the language communities, if they shall meet with the desired success. Given the sheer volume and complexity of the terminology problem, co-operation among the language communities with respect to the design and implementation of such terminology policies and strategies should be promoted and actively encouraged as much as possible.

3.2 Terminology creation activities

A systematic approach to organize the creation of terminologies should be taken especially by the smaller language communities, which would otherwise inevitably be swamped by foreign loan terms. Clear-cut objectives for this endeavour and the support by a declared terminology policy will definitely help. Co-operation within the same language family (e.g. the Romance or Nordic languages) secures a certain parallelism in terminology development and helps to maintain a high degree of terminological homogeneity across languages, which facilitates specialized communication within the respective language family. Depending on the individual language situation co-operation between subject-field experts and terminologists (or LSP experts or applied linguists trained as terminologists) may prove useful or even indispensable.

In fact terminology creation centres exist in Europe in language communities such as of the Catalan, Basque, Icelandic, Norwegian, Swedish and Finnish languages. Similar

terminology creation institutions definitely are needed in some other language communities.

3.3 Terminology information and documentation centres (TDCs)

Beside Infoterm, which performs distinct functions as a clearing house and referral centre for information in the field of terminology at international, European and national Austrian level (and which is the oldest TDC), there are several TDCs in operation in France, Spain or in the above-mentioned language communities, where the role of a TDC is combined with that of a terminology creation centre. In several other language communities a TDC is in the process of being established, further ones without would greatly benefit from the existence of a TDC.

In smaller language communities a TDC will more possibly than not be a central institution covering the whole area of the language community. In larger language communities the respective TDC will probably be the focal point of a network of smaller TDCs with similar or different foci.

The planned project for the establishment of the "European Network of Terminology Documentation Centres" (TDCnet) aims at linking up the existing and emerging TDCs in a physical network (in the form of an 'extranet' within the Internet) in order

- to increase the efficiency of operation of the individual TDCs via networking,
- to improve access to existing information and holdings,
- to assist the establishment of further TDCs, where they are needed.

3.4 Terminology associations

Terminology associations have been established at national or international level in order to meet immediate needs – especially those of individual users. At international level the Association for Terminology and Knowledge Transfer (GTW) was established in 1986 in order to organize co-operation among those interested in improved terminology software. Its first main task was to organize the first International Congress on "Terminology and Knowledge Engineering" (TKE'87) in 1987, which marked the beginning of a series of successful TKE Congresses. Between the Congresses the activities focus on pre-normative research and development in working groups. The International Institute for Terminology Research (IITF) was founded in 1989 in order to provide a forum for the exchange of experience of teachers and researchers in the field of terminology. A number of training courses were organized in countries having a particular need for terminology training, and for the training of terminology teachers and trainers – not to mention the annual International Terminology Summer School. Nordterm in the Nordic countries also provides a similar framework for the exchange of experience and organization of teaching and training opportunities in terminology science.

At regional level the Réseau international de terminologie et de néologie (Rint), the Red Iberoamericano de Terminología (RITerm) and the recently (1996) founded European Association for Terminology (EAFT) are organizing co-operation in the field of terminology for various purposes among related language communities. As a rule they

comprise among others also national or language community specific associations in their ranks.

Such language community specific associations exist for instance in Germany (German Terminology Association – DTT), Italy (Associazione Italiana per la Terminologia – ASSITERM), Greece (Hellenic Society for Terminology – ELETO) or are in the process of being established in the Netherlands and other language communities.

3.5 Purpose- or project-oriented corporate cooperation groups

Purpose- or project-oriented corporate cooperation groups in private industry or between private industry and public institutions exist in some countries, such as Switzerland, France, Denmark and Germany. Given the multitude of problems still requiring a solution in the field of terminology, such purpose-oriented co-operation groupings with their very pragmatic approach and flexible structure can be extremely effective and should further be encouraged whenever suitable.

3.6 Vertical terminology infrastructures

By far most of terminology work is carried out as a collective work by subject-field specialists under the umbrella of a more or less ‚authoritative‘ organization or institution. Legal (or quasi-legal) terminologies are e.g. determined by legislation or jurisdiction at international, European or national levels. Sometimes the terminology contained in technical rules/regulations at national level is also considered as quasi-standardized terminology. Harmonized/standardized terminologies are issued by an official public or officially authorized harmonization/standardization body. Often the documents containing such terminologies are referred to in laws, so that the terminology becomes ‚legalized‘. Quasi-standardized terminologies are prepared by a subject-field authorities recognized in the respective field (e.g. IUPAC) or by an institution/organization authorized for this purpose, but not belonging to the official standardization framework. Other kinds of ‚authoritative‘ terminologies are at least issued by or published under the patronage of a (formally or informally recognized) subject-field authority.

The authoritative nature of data (viz. the degree of authoritativeness) depends on the status of the data originator being

- a legal or quasi-legal (public or semi-public) authority
 - a harmonizing/standardizing (or quasi-standardizing) body
 - an ‚informal‘ authority in the respective subject-field and on whether it is
-
- prepared within the framework of a working group or committee/commission established for this purpose by the ‚authority‘,
 - prepared by one (or more) individual experts on behalf of the subject-field authority,
 - adopted by the subject-field authority from external originators,
- as well as on whether it

a) is prepared on the basis of a proper terminological methodology (such as following the respective ISO standards),

- b) consists of individual data being well documented (incl. indication of source references, originating body/expert etc., responsibility codes etc.),
- c) is prepared by (individual or a group of) subject-field experts possibly assisted by professional terminologists,
- d) is prepared by another kind of expert(s) (e.g. specialized lexicographer, translator, etc.).

As a rule there is no absolute ‘authority’ covering all applications, the authority in most cases is restricted to a (implicitly or explicitly) defined scope, but can often be extended towards similar/neighbouring applications.

Sometimes non-authoritative terminology being prepared by one (or more) individual experts on behalf of an issuing institution/organisation (e.g. publisher) may also acquire the reputation of being ‘authoritative’.

3.7 Terminology standardization

Terminology standardization covers two distinct aspects, which belong to two different infrastructures. The standardization of terminological principles and methods certainly belongs to the horizontal infrastructures, whereas the standardization of terminologies in the various technical committees definitely is an element of the vertical structures.

4 Outlook

The terminology infrastructures as well as the terminology market(s) are still characterized by the co-existence of many loosely interconnected elements. But gradually the mosaic of these elements is becoming more complete, while at the same time turning into a dense networking of interacting structures and activities. Co-operation in terminology, which started at international level, by now has got organized already at transnational level within the framework of some language families in Europe. Within the various language communities, however, there are very different language situations with respect to the evolution of terminology infrastructures and the terminology market. Nevertheless a certain pattern seems to evolve – as was described above.

The development of the terminology market and the development of an infrastructure mutually support each other. Some tasks/activities, such as the collecting and ‘housekeeping’ of information, which are in the public interest, must continue to be funded by the community, whereas others increasingly are (and should be) financed by the users, especially those from the private sector.

Obviously the development is speeding up recently, but there is still a long way to go. Access to information in the field of terminology is still not as easy for the user as it would be desirable. Co-operation among the ‘players’ in the field still needs promotion and support. Quality of information and services has to be enhanced with a view to user needs - which also requires a higher concern for multifunctional data. The teaching and training situation is still characterized by many ‘missing links’.

The planned European Network of Terminology Documentation Centres will be a cornerstone of the future terminology infrastructure in Europe. It will also support the further development of the terminology market by providing information on existing

terminology resources, activities, experiences, services etc. and on the conditions of their availability.

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Experiences and Comments on „Finland Towards Information Society” –Programme in Finland

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About the speaker

Jari Koivisto has graduated in theoretical physics at the University of Helsinki. He is working in the area of Finnish information society programme called „Finland towards Information Society,„. One of his main responsibilities is to co-ordinate several pilot projects run by various schools and institutions creating and testing methods of implementing information and communication technologies in general education. Previously he has been working as a teacher and a headmaster in upper secondary school. He has also been training teachers for many years.

Abstract

Finland is a country with a vast area and few people. This has led to situation where the average number of pupils or students in a particular school is quite small. There are hundreds of primary schools having only one or two teachers and under ten pupils. Therefore it is essential to make effective use of computers and telecommunication in providing information and exchanging didactical materials and in many cases exchanging education from one school to another or between schools and institutions. By using computers and networks in a proper way it is possible to create open and flexible learning environment in classrooms.

The key points of the presentation are

- The main features of the Finnish information society programme
- The measures taken by the Finnish government
- The recent findings of the Finnish pedagogical research
- Some pilot projects in Finnish educational system

1. Introduction

The number of computers in schools, homes and business and access to information services through networks has grown rapidly in Finland. At the same time the balance of industrial activity has shifted from pulp and metal industry towards high-tech production. This change has set new requirements to the skills taught in schools and other educational institutes. The students entering the labour market after school are supposed to be creative, reliable, flexible and able to work in groups.

It is no more possible to use traditional teaching methods where the teacher is supposed to be the main or only source of knowledge, where the textbook is supposed to represent the curriculum and the learning environment consists of the classroom without any links to the society outside the school. The school is changing its form very rapidly. Many things that were previously desirable cannot be used anymore. One of the interesting features in

the profession of the teacher is networking. It has grown more and more important. A teacher must communicate actively with other teachers, other schools, enterprises and teachers other countries in order to keep up with the new ideas in education. Especially those countries, which have been active in developing open learning environment, distance education and the idea of constructivistic learning, are important to teachers in Finland.

2. Infrastructure

The process of providing schools with computers has its roots in 70's but the real boom began in mid-80's, when municipalities started to make comprehensive plans to connect schools to backbone networks and enabling schools to connect to Internet and email services. Previously there has been some stand-alone computers and computer labs with a network inside the room.

The reason for increased activity was of course the world wide interest in computers and networks, but in Finland the availability of computers became much better at that time and relatively large number of PC-computers were sold to private enterprises and that was the signal that computers and networks might be of strategic importance to Finland. It is a country situated in an awkward place beyond the Baltic Sea seen from Central Europe's point of view.

The Nokia company manufactured PC computers at that time. The success of the Nokia Group has also been a very important signal in Finland about the significance of investing on electronic industry. This signal has later become stronger when mobile phone industry has expanded enormously and the market value of its shares has exploded.

Nokia was also the first to launch pilot project in schools already in late 70's. One of the first schools to have computer labs was Kempele Upper Secondary School near the city of Oulu. Nokia provided computers and sponsored also the first computer courses. The result is that Kempele school (<http://lyyra.kempele.fi/>) is still a prominent school using computers and networks as an integral component of its daily work. The students who attended those first computer courses are mainly working for Nokia now.

Currently almost all schools, educational institutes and universities are connected to the Internet by permanent or by ISDN-lines. The speed and capacity of connections are satisfactory even in the most remote areas of the country. The basis for good coverage is totally digitalised telephone network with an array of services and quite heavy competition in telecommunication area that makes also the line expenses low. The local area networks in schools are based mainly on thin Ethernet cabling and they need upgrading in a few years.

FUNET (Finnish University Network) is the backbone ATM network service for universities. There are also several commercial networks, but none dedicated solely for schools. The need for high capacity network services and especially content services is obvious and there are several initiatives to create services to satisfy this demand. In Finland there are tens of competing Internet service providers. This situation ensures moderate price level and quite good network services including ISDN. Modem

connections are becoming quite rare in schools and institutes, but homes rely heavily on modems when connecting to Internet. Line and service expenses are quite low and about 40 % of all households own a computer and most of them have acquired an Internet connection from some Internet service provider.

The number of computers in most educational institutes is not however satisfactory. The national average is 12 students per one computer. The figure varies considerably and in best cases it is about 3. In order a significant cultural change to take place in methods of teaching and learning it has been estimated that this ratio should be lower than 6 student per one computer. Otherwise it is not possible to expect deep changes happen in the curriculum of an individual school or institute.

3 Implementation

Investing on computers and networks is a kind of national survival strategy. This also includes heavy emphasis on using computers in schools and universities and other educational institutes not only as a tool to produce documents but also as a tool for learning. Distance education using networks in connection with face to face teaching has proved to be very successful in further education programmes for adults. There are a number of training programmes which use telecommunication and computer networks to lessen the need of face to face contacts between students and teachers and at the same time reduce the need of travelling. Simultaneously direct and hidden expenses of training are reduced.

Students especially in remote areas benefit from distance learning arrangements, but also those who must working outside normal working hours or their work might be irregular. Distance education is as well implemented in primary and secondary school education. It is necessary because schools in Finland are quite small with sometimes only one or two teachers. It is impossible for students in those schools to receive high quality teaching in every subject they might want, but using computers and telecommunication they can be connected to a classroom in an other school and they can receive tutoring from a teacher who is specialised in a particular subject. For instance in Utsjoki, which is the northernmost municipality in Finland has succeeded to increase the range of subjects and at the same time reduce the costs of education and children's need for travelling. Typically in Utsjoki children have to travel about 50 km between home and school.

Many cities have created high capacity backbone networks to serve the city offices. Examples of these are Helsinki, Oulu, Jyväskylä and Kuopio. The technology infrastructure of those cities is very well developed. The purpose is to attract high technology companies to invest in the city, create work placement and get good taxpayers from those who are moving to the city. The city of Oulu is a real success story with a number of high technology enterprises.

4 „Finland Towards Information Society” –Programme

The current progress in the Finnish society and the need to make the educational system more effective and to meet the demands of the industrial and economical infrastructure has initiated the Finnish government to launch an information society programme. It is called

„Finland towards Information Society” spanning the years 1996 to 1998. The Ministry of Education is responsible for putting it into effect in the area of University education and the National Board of Education in the area of general and vocational education as well as the area of adult education outside universities. The national steering committee called „Information Society Forum” chaired by the Minister of Education Mr. Olli-Pekka Heinonen is co-ordinating all activities nation-wide. The members of the committee represent all interest groups in Finland.

The programme is segmented into four parts reinforcing each other and financed equally by government and local authorities.

Computers for schools and educational institutes

Almost all schools in Finland use some kinds of computers, but in order to have them as an integral part of learning environment they must have a reasonable capacity to fulfil the needs. The aim of the programme is to provide enough computers to enable students to work at least one hour a day using a computer. Current situation is not yet satisfactory, because there are approximately 12 students per one computer. It means that the students are not able to work as much as is needed to integrate computers and information technology as a part of their normal learning routines. There is not much hope to make this situation better, because the number of newly acquired computers do not essentially exceed the outflow of old computers from educational institutes. Only in a few cases there are three students per one computer and this has clearly resulted in a significant cultural change in the learning environment in that institute.

LANs, WANs and Internet connections to schools and educational institutes

A computer without access to some kind of network is nowadays almost useless. Therefore it is necessary to build a network infrastructure to every school. The main technical solution for this is building or hiring permanent connections, which connect schools to backbone networks of the cities or in some cases to independent network service providers. Many schools are implementing or planning to implement switched technology and ATM. About 80 % of all schools have satisfactory Internet connections. The rest have low capacity modem connections, but the programme encourages those schools and institutes to acquire connections with higher capacity.

Pedagogical further education for teachers

In order to understand the needs and possibilities of information and communication technologies (ICT) in education the teacher must have further pedagogical education. National Board of Education has financed five weeks pedagogical training packages for teachers. They are provided mostly by the further education centres in connection with number of universities. The resistance against adopting new teaching methods is quite strong in many schools, but if a team of teachers in a particular school has completed these studies, there has normally been a notable cultural shift in the teaching practices towards more modern approach. It has also been noticed that five weeks is by far not enough to cause any major change in teaching practices. Still there is a justified belief that by year 2000 the learning environment should be considerably different from what it was before the programme was initiated.

Teaching methods development and learning materials for schools and educational institutes

The cultural change in schools towards modern, open, interactive and co-operational learning environment is hardly achievable only by adopting measures previously mentioned. There are about 20 pilot projects launched aiming to create and test new methods of using ICT as a key element in learning environment. The research on learning psychology and pedagogy is an essential part of these projects. Some areas of the methods development are for example distance education in its many forms, environmental studies, literature and reading, co-operation between schools, education for disabled and microhistory of locally confined areas in cities. The production of learning materials consists of WEB-sites, CD-ROMs, books etc. It is mainly run by the National Board of Education. There are also a number of private producers in the area, but the market is so small in Finland that the profitability is not necessarily satisfactory.

As mentioned earlier most of the theoretical background in the Finnish education development comes from a group of modern learning theories called constructivistic theories. These theories emphasise the active role of learners constructing their own knowledge and skills. Learning requires genuine cognitive processes in learner's mind. Previously this was far too often forgotten in the Finnish schools. This new approach has changed the role of a teacher significantly towards a facilitator and a designer of the learning environment. The possibility for a learner to use working methods of an expert is also often mentioned in the Finnish educational discussion.

The process of implementing new ideas to Finnish pedagogical discussion is a slow, but the success of further education programmes among the Finnish teachers is promising. It is also estimated that about 20 % of all teachers have changed their methods of teaching so that the role information and communication technology (ICT) is in key position in their work with student. There also seems to be a kind of competition between universities and higher education institutes and also some schools in implementing ICT as an essential part of their administrative system. This means that for a student he or she has to use networks in order to get information about courses and timetables. The student has also to use networks in order to register to examinations and read about the results.

The information society is a widely discussed issue in Finland. The technical infrastructure is not anymore so interesting because computers and modern communication technology is available to everyone who is interested and willing to pay for it. The issues are contents, moral and responsibility. What are the implications of modern information technology on the functions of the society and the life of an individual?

5. Evaluation

The parliament of Finland has done an extensive evaluation about current situation ICT implementation and technology in Finland. The project has resulted in an ample collection of data about current state of information society development mainly in the area of education. The evaluation based on work of about 100 persons for about one year. Main sources of information were literature, interviews and case-studies. The computer and network facilities are following:

	Students/PC	Students/Internet connection
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Primary school	11	22
Secondary school	14	21
Vocational school	4	5
University	15	NA

Most popular ways of using ICT

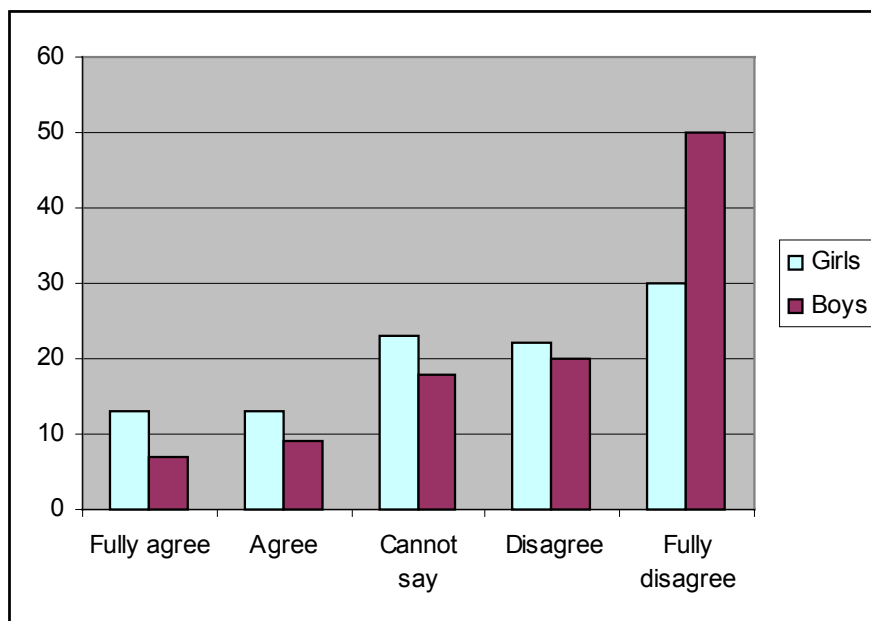
- Word processing
- Surfing in the Internet
- Using email
- Using graphics software
- Studying computer science

Who is making the decision of using ICT

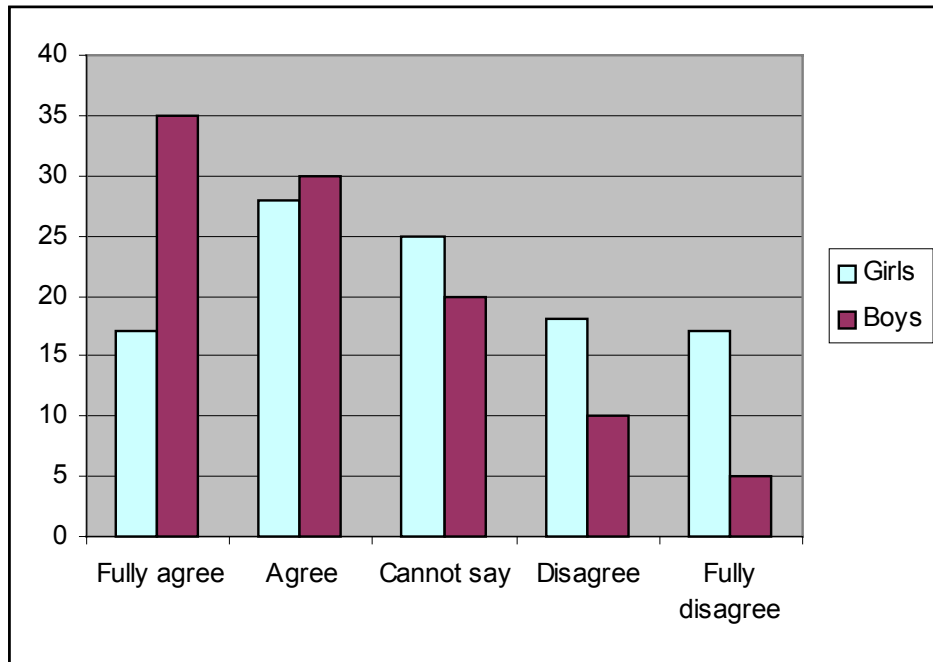
- Teacher (96% of all schools)
- Separate ICT courses in curriculum (64 %)
- Required skills are defined (46 %)
- The use of ICT is defined subject by subject (26 %)

In the following there are a few claims and the statistics how the student at the age between 10 – 20 have given their answers.

„I write rather using pen than a computer”



„I want to use more ICT in my work at school”



Possibility to use ICT at home

USERS	PC		Internet	
	M	F	M	F
Teachers	83	83	30	30
University students	81	67	34	19
Secondary school students	90	79	60	
Primary school students	76	74		
All households	40		20	

Profiles of persons using and not using of ICT

Using	Not using
young	elderly
man	Woman
large income	small income
living in the southern part of Finland	Unemployed
living in urban area	living in „developing” area
Well educated	non academic
Oriented to technology and science	oriented to humanities

Generally the current status implementing information technology in Finland is proceeding in a very good pace. The technology is not the problem but the contents, culture and commitment.

The role of knowledge in the increasing competition

István Fodor
Ericsson Hungary

Changes in the world are generally governed by their own rules, and are characterized by old and new elements. In addition, these elements also change continuously. In order to adapt to these changes, it is worth getting to know these elements, but one has to reckon with the fact that this is a never ending process and we should expect newer and newer phenomena. Latest experiences may result later, but by all means more precise findings than forecasts and conclusions can be obtained with analytic methods.

In connection with the success story and technology transfer in the Hungarian telecommunications industry, that has recently started and is continuing today, we can find the answer to several current questions. ETH has started from scratch in 1991 as a subsidiary of Ericsson, and became the largest telecommunications company in Hungary. Ericsson Kft. is also the largest company dealing with applied research and software design in the country. This example presents some regional features in addition to an intensive and overall transfer of technology.

In order to know the interactions of market economy and the information society, it is expedient to distinguish between three processes: globalization, the formation of the information society, and the consumer society. Although these processes overlap considerably, we can find typical motivations and characters in each. These processes have different affects from the transfer of knowledge and the knowledge point of view. To simplify, it is enough to deal with the first two, for these are determinant processes – the consumer society is rather a consequence.

Globalization results in a pressure to compete, it has a general and mostly unavoidable effect. It can be tamed in certain cases. Appropriate level of competitiveness is needed in order to survive the process of globalization. The factors of competitiveness has two categories: one is the costs, the other is effectiveness, innovation ability and education. (These two groups have approximately the same importance.) The compulsion of competition, or more precisely the increasing competition induces effective operations, innovative actions and a well-trained background both on the corporate and social level, in addition to reduced costs. All this is based on the necessity of knowledge and propagates its growth and expansion. In other words globalization can stimulate knowledge if we do not let the increase of competitiveness to be interpreted solely as a decrease of costs. Motivational factors within the market economy changed for the same reasons: today not the technological development creates markets, but market demands determine the steps of technological development. Applied research and development do not exist without goals and deadlines. This has not only increased the appreciation of the role of knowledge and its transfer, but the process and structure of its functioning also changed. Priorities and values change. In order to increase competitiveness continuously, such changes have to be carried out in all segments of the economy simultaneously, i.e. in company management, financial policy, services or technology. In these processes and changes people with proficient knowledge of their professions are needed. Development has

become a key notion to such an extent that we can state: man has the principal role in globalization. Though this statement seems to be contradictory itself. The most important element of the overwhelming and inhuman competition, and of the program aiming at higher profits and market share, is the creative man owning the knowledge. For instance, TQM (Total Quality Management), tailored for this process, is also based on three main elements: customer, developments and man. This also focuses on the players with thirst of knowledge. Or isn't the contradiction that high?

Information society is basically a new lifestyle, a new social behavior. It has a global effect and increases in time. It has a considerable effect on the increasing and transfer of knowledge as well as on technological development, but it is rather a catalyst than a triggering factor. Thorough knowledge information, cooperation, availability unlimited in space and time help the appreciation of knowledge to a great extent.

In another dimension, the competition of individuals started. Unemployment results in competition itself, but a new phenomenon can also be seen in the sphere of employees: the prestige of a profession chosen for a lifetime prevails no longer, the development of the individual and perhaps the change of profession is needed as the circumstances change. A new notion: employability appeared . This is mostly valid for the operative part of the economy, but it can also be seen in research and development in a different way.

The most important processes entail several changes. The structures of proprietors have changed, new values have taken shape in the society, service and manufacturing structures of companies change, technological integration of subcontractors increases, a host of alliances come to life, acquisitions of companies are more frequent, new monopolies appear following liberalization, processes speed up and become more complex. For instance, in certain industries one player is not able to perform determinant research and development alone. The sphere of the owners of the more valuable knowledge has changed. Specialty and speed put the focus on young graduates. Courageous initiatives often surpass the value of experience. This age-group is the basis of company development first of all in the field or research and development, but a higher moral level than the average of the society is also needed to perform successful work.

If we take a look at the process from the knowledge point of view and the man owning it, in spite of all the contradictions man is not only an exceptionally important player, but also a global leader. This is an opportunity, not a built-in mechanism. Of course, a real opportunity to practice exists only if these relations are known by the players. And there is still a lot to do in this field.

Revitalisation of the market or reconstructing hierarchies? Declining companies and emerging markets in the information age

by Professor Katalin Szabó
Budapest University of Economic Sciences

By the end of the millennium many institutions that previously seemed stable, reliable, and well-established, e.g. the welfare state or eight-hour employment, have proved fragile, unstable, even transient. Changes have also disarrayed the business sphere. “What began, quietly, more than a decade ago, has become a *revolution*. In industry after industry, multilevel hierarchies have given way to *cluster of business units co-ordinated by market mechanism* rather than by layers of middle-management planners and schedulers. These market-guided entities are now commonly called “*network organisations*” and their displacement of centrally managed hierarchies has been relentless, though hardly painless - particularly to the million or so managers whose positions have been abolished. (*Snow et al* [1992] p. 5. - (Italics by me - K. Sz.) In the wind of the information revolution, the traditional organisation of the companies has been utterly transformed, and is being replaced by a completely new organisational architecture: the networks. If the twentieth century was the century of corporations, the twenty-first century - as far as it can be deduced today - will be the century of networks.¹ In my paper I try to answer three basic questions related to this new trend:

1. What are the reasons for replacement of companies by networks?
2. Can we provide proof for the general view that the process of networking means that the market gains ground at the expense of hierarchies?
3. Will Hungarian firms be able to join the world-wide current of networking?

I. Business networks - Domestication of the uncertainty

Networks are based on three fundamental features: *long-term co-operation* between a number of companies and other economic units, *interaction that is complex and frequent* and *common interests* that evolve through collaboration. Within networks, complementary functions are performed by a varicoloured assortment of organisations²: from the head offices of giant enterprises to state research institutes, “off-campus” companies, research laboratories, self-employing experts etc. “Networks are constructed when *multiple entities* - whether individual or organisations - *interact* ...a network is *more than merely the sum of dyadic interactions* among its various members. This is because each dyadic relationship is affected by the “*embedded context*” in which it occurs - that is, by the *positive or negative secondary effects* flowing from each party’s relations with others in their networks. “ (*Anderson et al* [1994] - Italics by me K. Sz.)³ Ongoing co-operation

¹ *Peter Drucker* has suggested that the Fortune 500 list may not exist in 10 years because many companies are growing through alliances. (Cited by *D`Alessandro* [1997])

² See *Moore* [1993]

³ Cited by *Walker* [1997] p. 75.

between organisations is obviously not a new phenomenon in a market economy. “*What is new* about network organisational forms is not that their members rely on outside partners for special expertise, but rather *the number and nature of the competencies they outsource* and the large number of interdependent partners involved. Network members--particularly those involved in the "vertical market" and "inter-market" forms *...are outsourcing⁴ entire operating functions* that most firms traditionally considered proprietary and essential competitive competencies, such as *marketing, manufacturing, or R&D.*”(Walker [1997] p. 4.) It has to be noted that not every inter-organisational series of transactions produces networks or network organisations. “A network⁵ organisation is *distinguished from a simple network of exchange* linkages by the *density, multiplicity and reciprocity of ties* and a *shared value system* defining membership roles and responsibilities. (Achrol [1997] p. 59.- Italics by me -K. Sz.)

The motivation behind networking

The volatile conditions of the external environment necessitate the establishing of semi-attached, flexible networks of companies that are always ready to adapt to altered circumstances. The information society that was born and is developing before our eyes, the beginning of a new technological era⁶ where fordism⁷ is replaced by toyotism, and globalisation all enhance the complexity of the external environment and the unpredictability that it breeds to levels that are beyond the capacities of company strategists. The larger, more complex, bureaucracy-ridden business empires are, the more sluggish and incapable they become of adapting to the change of conditions that was primarily brought about by them through their technical advances and conquests in the market. Giant companies are increasingly unable to deal with the uncertainties that actually spring from their own existence.⁸ The incongruence between the speed of reaction

⁴ Like numerous new phenomena, the outsourcing has no generally accepted definition. In the narrowest definition outsourcing means, entrusting external companies (supplied them with the facilities and equipment) to pursue tasks and functions that were originally the responsibility of the delegating company. Outsourcing is spreading with great speed amongst large enterprises world-wide. “Five years ago, outsourcing was pretty much a new, innovative way to run a corporate mailroom. *Today outsourcing services are available for everything* from managing the mailroom to functions involving benefits administration, data processing, legal services, computer operations, telecommunications and temporary staffing.”(Frost [1993] p. 40.) (Italics by me - K. Sz.)

⁵ This new form of organization is the common designation of complex “vegetation” of corporations which are composed of a number of company-groups greatly different from each other. Literature refers to networks under various terms; e.g. *modular organization* (Tully [1993]), *virtual cooperation* (Byrne et al. [1993]; Davidow-Malone [1992]), *organic network* (Morgan [1989]), *hybrid arrangement* (Borys - Jemison [1989]; Powell [1987]), *value-added partnership* (Johnston - Lawrence [1988]), and *inter-organisational configuration* (IOC) (Levinson [1994]).

⁶ See in details Kocsis - Szabó [1997]

⁷ Fordism is basically the synonym of *mass production*. Ford’s famous T-model, along with the assembly line first installed in 1913, transformed not only the US, but the whole world in the first decades of the century. At that time, Fordism was merely the symbol for everything characteristic of what is known today as modern capitalism. These days, this production philosophy and its corporate organizations are being superseded by Toyotism, a production philosophy of *mass customization* and organizational model that caters for the emerging information society.

⁸ Giant companies and the unpredictability of the market are linked concepts mainly because one giant corporation can make the law of large numbers invalid. If there are ten thousand actors on the market, there is a good chance that their actions will counter-balance each other. In a dual-option situation, e.g. tossing a coin, the real proportion between “heads” and “tails” will be very close to a 50-50% ratio. However, if two or three actors control the market, it is possible that all three will get “heads” or “tails.” Few actors on the market can therefore cause great economic fluctuations that are only partly balanced by their cooperative

new circumstances require and the unresponsiveness of dinosaur-like corporations call for a new organisational form. This new form is that of networks.

It is precisely because of their flexibility that networks are designed to function in uncertain circumstances. Their resilience is not a temporary feature developed to meet the requirements of a particular challenge on the market, but a fundamental principle in establishing corporate organisations of the type. “Tomorrow's successful organisations will be *designed around the building blocks of advanced computer and communications technology*. The success of these organisations will come from the ability *to couple to, and decouple from*, the networks of knowledge nodes. These networked organisations *will link, on an as needed basis*, teams of empowered employees, consultants, suppliers, and customers. These *ad hoc teams* will solve one-time problems, provide personalised customer service, and then, as lubricant for subsequent interactions, evaluate one another's performance.” (Jarvenpaa - Blake [1994] p. 25. Italics by me - K. Sz.) Giant companies in the centre of networks surround themselves with smaller units that are “...much like Lego blocks, parts can be easily added or taken away...” (Dess - Rashed - McLaughlin - Priem [1995] p.7.)

In networks, everything is in motion, and adaptability as opposed to the stability of the vertically integrated “Fordist” companies, is an important distinctive feature of networks. (Osborn - Hagedoorn [1997]) There are no permanent, fixed connections and relationships either inside or outside networks, and what is more, even the position of units - whether they are internal or external to the network - change constantly. “Organisations have realised that, while it may be convenient to have everyone around all the time, having your workforce's time at your command ...It is cheaper to keep them outside the organisation, employed by themselves or by specialist contractor, and to buy their services as you need basis. (Handy [1989])⁹ (Italics by me - K. Sz.).

The fact that the transaction costs and the expenses of inter-company communications have radically decreased has made the establishment of even inter-continental networks possible and profitable. Companies gain more from contracting out the possible largest number of activities, even functions that are within their main profile, than if they had employees carrying out the same functions. Supervising a network of outside contractors is much easier than overseeing importunate employees who persist in their opportunistic behaviour, go on strikes, and demand raises. External contractors, on the other hand, severely depress their prices in order to remain competitive, improve the quality and delivery period of their services or commodities, and can even be reached 24-hours a day. A network of contractors means that contracting for all activities is done in a *competitive context*. (D`Aveni [1995]) This is the main reason why large companies with a monolithic structure are being supplanted by mobile, loosely knit company groups integrated by the market. It seems that all of the physical production processes - the “hardware” of production - will gradually be relegated outside. While at the same time, the “software” of production, the intellectual processes of management and planning for the future i.e.

planning and market stabilizing activities since these concordances are often a secondary consideration to competition or protecting their diverging interests.

⁹ Cited by Dess et all [1995] p. 8.

research and development¹⁰ remain within internal structures. In large companies, the significance of material capital has greatly diminished and virtual capital, which manifests itself in network connections, establishing, managing networks, and regulating global economic processes, is becoming predominant.

The choice of organisational forms or the question of whether the company increases or decreases in size is not at all a problem of management philosophy or trends, but a strictly expense-oriented appraisal of available options. If outsourcing¹¹ sub-processes or activities leads to transactional costs increase higher than the profit to be gained from specialisation and the competitive offers of contractual partners, the company itself will take up the given activity. In these cases, companies - to use the Coasian terms - opt for hierarchies against the market. If, on the other hand, the costs of market transactions radically are decreasing - as they are - ,and meanwhile the profit gained from subcontractor's hyper-competition is increasing, it is only sensible to hand these tasks over to market partners, i.e. the market gains ground from hierarchies.

The variability of modern information technologies is ideal for loosely-knit networks that nevertheless need to be co-ordinated and integrated. Computers have influenced the structure and “metamorphosis” of organisations more than any of the previous technical innovations.(*Leavitt-Whisler* [1988]; *Bjorn-Andersen - Turner* [1994])_They are the instruments, conditions, driving force and products of the development of global, inter-organisational networks. Within these, the exchange of knowledge and information is constantly in progress. (*Johanson - Mattson* [1987]) *Learning* is the key category aim and propelling force behind the advancement of networks.¹² Information-gathering and knowledge-generating relationships can only unfold their full potentials if inter-company contact is regular. Recurring co-operation between companies establish a relationship where gathering information and learning is more effective than in occasional informational acts. The risk of incorrect or intentionally falsified information entering communications decreases simultaneously. (*Sweeney* [1996]) Durable relationships also make information gathering cheaper since the complicated and costly inspection of the received knowledge's quality becomes unnecessary as trust develops between partners.¹³ In the next table we try to show the causation chain for networking.

¹⁰ Actually, this is not completely true. There is an emerging tendency to outsource sub-elements of research and development like the conducting of surveys and dealing with mechanical or dangerous tasks. Strategically crucial processes nonetheless remain internal.

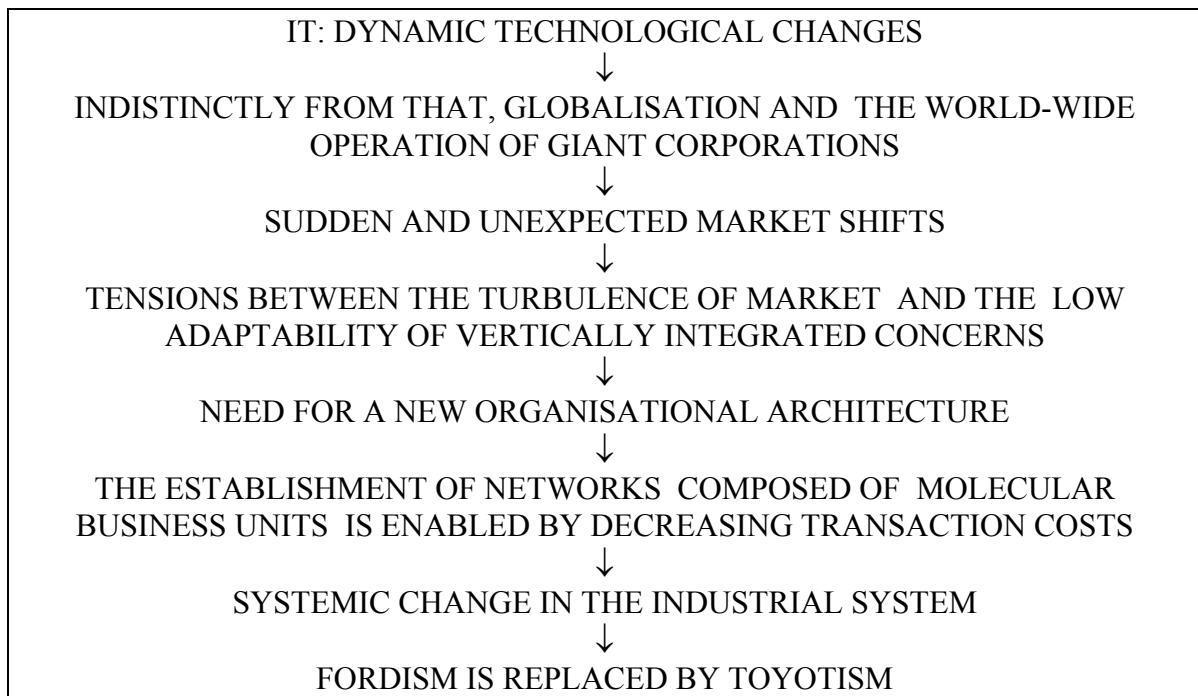
¹¹ Like numerous new phenomena, the term of outsourcing has no generally accepted definition., In the narrowest sense outsourcing means entrusting external companies with the facilities and equipment to pursue tasks and functions that were originally the province of the delegating company, internal to its structure. Outsourcing is spreading with great speed amongst large enterprises world-wide. “Five years ago, outsourcing was pretty much a new, innovative way to run a corporate mailroom. Today *outsourcing services are available for everything* from managing the mailroom to functions involving benefits administration, data processing, legal services, computer operations, telecommunications and temporary staffing.”(*Frost* [1993] p. 40.) (Italics by me -K. Sz.) About the issue see *Earl* [1996].

¹² “According to *Powell* [1990], firms more likely to engage in network arrangements will be those needing to exchange difficult-to-codify, knowledge-intensive skills that are best transferred through processes of collaborative information sharing. *Powell* also pointed to firms engaged in fast-moving industries with short product cycles as likely to engage in network partnerships in order to reposition products rapidly and respond quickly to changing market conditions and technological developments.”(*Larson* [1992] p.76.)¹²

¹³ The significance of trust in informational relationship cannot be overemphasized. Knowledge is par excellence a credible good.

Table 1

Driving forces of networking

**Market or hierarchy?**

Networks alter the basic principles of economic relations, yet theoreticians have not devoted enough attention to this historical development of economy.¹⁴ It is probably because of this that many economists interpret the reorganisation of large concerns into loosely knit networks as a simple case in which the market gains ground at the expense of hierarchies. Although the transformation of large organisations into networks of independent contractors does without a doubt revitalise the market (*D'Aveni* [1995]), it must be noted that it also *changes the nature of market relationships*. Networks are not simply modern day equivalents of 19th century competition, but something altogether novel and unknown. They are as different from the market as they are from hierarchies. (*Powell* [1990]) Hierarchies function with settings where *commands* and *regulations* or *superior* and *subordinated positions* are the basic parameters. In contrast, the most important dimension of the market is *mutuality* i.e. a world of voluntary transactions based on the equity of value in exchanges. However, networks are distinguished from both forms of co-ordination mechanisms in one respect; there is *reciprocity*¹⁵ in their transactions.

¹⁴ "The literature on industrial networks is extensive (*Forsgren - Johanson* (eds.) [1991]) but, up to now, the subject has been mainly approached from a marketing or an organisational, rather than from an economic, perspective." (*Dunning* [1995] p. 468.) Authors like *Tirole* [1988] or *Milgrom* (*Milgrom - Roberts* [1992]), who try to analyse the networks, seem to be exceptions.

¹⁵ "Emphasis is increasingly placed on *complementarity*, *self-reinforcing relationships*, and the *reciprocity* between the core-company and its partners." (*Ching et al.* [1996] p.181.)

Mutuality, characteristic of ordinary sale-purchase exchanges, means that one actor will only perform actions for the other's benefit if his partner *simultaneously* offers him a return benefit of the same value. (c.f. *Stephens* [1996] p. 536.) The *reciprocity* of network operations is not a direct and simultaneous value-exchange, but an arrangement where the connection between actions performed for the partner's benefit and its counter-services is indirect and loose. Further distinguishing aspects of networks are: 1. a cheater detecting mechanisms that filter out participants who would avoid the responsibilities of reciprocity. 2. the large (indefinite¹⁶) number of possible network interactions. Willingness to participate in network interactions only appears if the number of interaction are undefined. If network partners anticipate a long-term relationship, it is in their own interests to be fair and co-operative in order to secure the other party's loyalty for the future. If, however, the interaction's duration is definite, being generous or honest at the expected end of interaction is not a profitable enterprise as it will not be reciprocated at any given occasion in the future. Thus the boundaries of network-like co-operations *are shifting not merely in spatial terms, but are even in a way infinite in time.* (c.f. *Hámori* [1998]) In the next table we try to summarise the properties of three basic governance forms in order to replace the new phenomenon: network between the market and hierarchy.

Table 2

Networks in comparison with classical governance forms

	HIERARCHY	NETWORK	MARKET
<i>Main integrating Force</i>	command	co-operation	competition
<i>Nature of Relation</i>	power subordinate status	reciprocity balanced relation	mutualism balanced relation
<i>Co-operation</i>	closed	indefinite in temporal and spatial terms	indefinite
<i>Technological base</i>	Mass production	Mass customisation	unspecified
<i>Integration</i>	vertical	hybrid	horizontal
<i>Adaptation</i>	slow periodical	quick permanent	quick

Although one might attempt to make marked distinctions between networks and other two co-ordination mechanisms with the aid of the principles of *reciprocity*, *spatial* and *temporal indefiniteness*, it is quite clear that these co-ordination forms are interrelated too. Networks, at first seem like the direct opposite of hierarchies, but upon closer insight it can be deduced that they are in fact a special amalgam¹⁷ of the market and hierarchies.¹⁸

¹⁶ With a knowledge of infinitely repeated games, it is possible to mathematically explain why an indefinite number of stages is a necessary condition of effective cooperation ('Hanged man paradox').

¹⁷ *Williamson* shares this view: "*Williamson* [1991] has tried to come to terms with these network forms in recognizing what he calls the *hybrid forms* of governance. Hybrids combine aspects of market transactions

The inordinate decrease of transactional costs, especially those of communication, not just enable large companies to transfer functions and activities that were originally attended to by itself to market in the form of outsourcing. Rapid development of information technologies also cast a new light on the workings of hierarchies.¹⁹ New information technologies have the effect of diminishing the expenses of monitoring, internal controlling and of overseeing such complex systems as networks. *The proportion of market- and hierarchies-specific characteristics differs from network to network.* It is possible that a network is actually a hierarchy in a changed form,²⁰ especially in networks organised from the top²¹ and linking companies of different position and power. Some satellite-company networks organised around solar companies are more dependent on their “clients” as small suppliers than traditional employees are on their employers. Not to mention the fact that - in contrast with the latter - there are no effective powerful trade unions behind outworkers. The next table shows the infusion²² of hierarchical elements into the inter-network market relations among the independent network units.

and characteristics of hierarchies and fall between the two alternatives on a continuum.” (Cited by *Larson* [1992] p.76.)

¹⁸ Like all new formations, networks are constructed out of a combination of existing elements. Both characteristically market-transactional and hierarchies specific elements make their presence felt beside exclusively network-particular features. Core companies and their assorted set of partners - like ordinary market actors - are free to choose their partners at a certain stage of network organization, but as soon as these choices have been made, they become subordinated to the network as whole, and are more or less “locked in” to intra-network relationships.

¹⁹ See *Zenger - Hesterly* [1997]

²⁰ Therefore it would be a great mistake to decisively contrast traditional companies and networks. Negotiation mechanisms, partnership-like relationships, reciprocity is present to a degree in the most rigid vertically integrated companies, while some networks, e.g. franchise systems based on the strategies of McDonalds, are extremely centralized and leave very little autonomy to the - legally independent - entrepreneurs that belong to the restaurant chain. (c.f. *Grandori - Soda* [1995] p.195.)

²¹ We would prefer to suggest that any restructuring of the activity of large firms reflects their preferences for replacing *hierarchical* with *alliance relationships*; and, that an increasing number of small firms are, in fact, part of keiretsu like networks, which, more often than not, are *dominated by* large, lead or *flagship firms*, or as *Lorenzoni and Baden Fuller* [1995] put it. "strategic centres" (*D'Cruz* - [1993], *D'Cruz - Rugman* [1992]) (See *Dunning* [1995] p. 467.)

²² C.f. *Zenger -Hesterly*

Table 3

The infiltration of inter-network market exchanges by hierarchies

<p>MARKET RELATIONSHIPS ARE IN MANY CASES HIERARCHICAL RATHER THAN EQUAL - SEE FRANCHISE NETWORKS, SOLAR FIRMS AND SATELLITE ETC.</p> <p>SOMETIMES THE SUBCONTRACTORS ARE UNDER STRONGER CONTROL THAN THE EMPLOYEES (NO TRADE UNION).</p> <p>CONTRACTS OFTEN GIVE FIRMS THE RIGHT TO USE HIERARCHICAL MEANS: INCENTIVE SYSTEM, PERFORMANCE MEASUREMENT, REWARD AND PUNISHMENT.</p> <p>ON THE INTERNAL MARKET OF NETWORKS LOYALTY IS REQUIRED FROM MARKET ACTORS AND EXCHANGES ARE INHIBITED BY PERSONAL DEPENDENCE</p>
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Nevertheless network hierarchy - if it exists - is not to be confused with the rigid hierarchies of "Fordist" corporation. This is all the more so since *intra-network co-operation never extends over or beyond the market*. There are sale-purchase transactions between solar companies and their satellites, but as these are not occasional but durable contractual operations, the partners are also bound together by strong social bindings²³, not just opportunities for mutually beneficial exchanges. All the same, rigid and extremely hierarchical networks are more an exception than the rule. *Reciprocity* is the definitive coordination mechanism in most networks, even in those that are organised from the top. (Dryer [1996]) It also has to be noted that competition between network members and between those inside and those aiming to get inside networks *has revitalised the market competition* that seemed to be withering during the reign of large bureaucratic companies.

This - process- as we can see above is in actuality far more complex than we could it simplify as an imperialistic extension of one governance form at the expense of the other. Therefore, instead of immersing themselves in the obsolete dilemma of 'the market or hierarchies', companies are seeking the optimal combination of the two basic principles of the governance. The decrease of internal transactional costs also means - as Zenger and Hesterly pointed out in their excellent paper - that the big corporation itself is turning into a network, reorganised of its inside modules, and market-like strategies and reactions proliferate within companies as well. (Zenger - Hesterly [1997])There is a definite tendency for infiltration the traditional integrated firms by the market due to the necessity of quick reactions. The challenges of the rapid and unexpected markets shifts force the captains of industries to reorganise the conglomerates and deconstruct them into molecular units, that behave as a real market actor building inter-firm market relations among each other and with the outsider as well. The next table shows the appearing of market elements inside the traditional hierarchical firms.

²³ Partners learn to accommodate to each other. In a similar way to long-married couples, they seem to become like each other in technical, logistical, administrative and financial strategies.

The Infiltration of Hierarchies by the Market

CORPORATIONS ARE DISAGGREGATED INTO MOLECULAR UNITS ORGANIZED FROM THE EMPLOYEES (AD HOC TEAMS, PERFORMANCE ORIENTED WORKGROUPS ETC.)

THESE SEMI-AUTONOMOUS UNITS FUNCTION IN A VERY SIMILAR WAY TO EXTERNAL CONTRACTORS.

IN MOST CASES THEY ARE DIRECTLY LINKED TO THE MARKET, THEY FEEL THE NEEDS OF CONSUMERS, THEIR RESULTS ARE MEASURED BY THE SATISFACTION OF CUSTOMERS.

INSTEAD OF MEASURING THEIR INPUT - LIKE ANY OTHER MARKET ACTORS - THE OUTPUT IS MEASURED.

THEREFORE THEY ARE LESS OPPORTUNISTIC THEN TRADITIONAL EMPLOYEES

DUE THESE AUTONOMOUS UNITS THE REACTIONS OF CORPORATION GETS QUICKER, MORE CUSTOMER-FRIENDLY AND MORE ADEQUAT COMPAIRING THE REACTION OF CLASSICAL EMPLOYEES OR BUEROCRATS

In the age of global networks/ the Internet ,spatial positions are *increasingly losing their significance, especially as regards to what is 'within' and what is 'outside' them.* Nowadays, the units of economic organisation resemble LEGO-blocks more than the traditionally clearly defined units of the past. Modules connect with each other on a 'whatever is the most practical in the given situation' principle. Transactional, co-ordinating and overseeing costs have dwindled to the point of providing for the *constant reorganisation* and ad hoc organisational structure of companies. This genders an ability to adapt to the turbulent changes and extremely capricious shifts of circumstances. The previously periodically activated function of learning and teaching thereby becomes the most important mission of business organisations. As this does not seem to fit into the established theories on industrial organisation and market, a thorough revision of existing theories is called for.

II. Networking as Hungarians do it

On the basis of the above-described dramatic changes, Eastern European countries aiming to integrate into conventional market economies *unexpectedly find themselves in "alliance capitalism"*²⁴ *instead.* Only companies that were capable of changing their strategies, organisational forms, branches, fields of activity, attitudes and markets were able to adapt to this New World. The most of economic actors in Hungary have overcome this challenge remarkably well, and *dynamic network development* can be observed. It might be surprising for outside observers that the *most modern network formations have appeared in Hungary*, even if there is a slight "transitional" quality to them.

²⁴ See Gerlach [1992] and Dunning [1995]

Successful cases of adaptation are inseparable from network organising or joining global business networks.²⁵ The cases described in this paper represent *four distinct types* of networking.

Under the umbrella of foreign companies

With sluggish, large Hungarian enterprises that were continuously protected from the challenges of the market in the old regime, the network joining strategy that proved to be the most successful was involving foreign capital. Giant enterprises privatised by foreign investors were spared the slow evolutionary route of network organisation and, without losing any time, found themselves in international networks. This is what the giant telecommunication²⁶ corporation MATÁV²⁷ did quite successfully when it split off from Magyar Posta (Hungarian Post Offices). Telecommunication technologies possess perhaps the closest contact with institutional transformations going on in the world, e.g. globalisation, the proliferation of user-friendly applications, continuous innovative processes, knowledge-driven institutional development, and the “resurrection” of competition. Therefore it is probably not by chance that MATÁV was one of the first to join international corporate networks. Its privatisation and joining a network was basically simultaneous.²⁸

At the end of 1993, an American-German consortium²⁹ acquired a more significant share (33 percent) in the large company. After two years, the syndicate owned 67 percent of the shares and thereby became the majority shareholder. In this case, the rate of success of integrating into an international network is not necessarily measured on the basis of the fact that MATÁV's sales - with the aid of a World Bank loan - doubled between 1993 and 1996. It seems much more opportune to consider that the company's technical advancement - thanks to the investments and inter-organisational learning opportunities offered by these networks - is at least at the level of the European average. Ironically the Hungarian telecommunications infrastructure is better developed technically than its German counterpart, which was mostly installed earlier. It is perhaps an even better feat of modernisation that the number of phone lines was raised from 800,000 to 2 million in the 6 years between 1990 and 1996. The waiting period³⁰ for the installation of telephone-lines has also decreased from 8-10 years to 1-2 months after the reorganisation of MATÁV.

²⁵ Success was not measured on the sales or momentary profit of companies. It is more important to see how successful they are in adapting to the conditions of network capitalism. Dead-end routes are also not defined by monetary losses, but by not being capable of adaptation.

²⁶ Telecommunication is by definition a network-like phenomenon, since the rendered services are performed in the first place on a network, and this network is usually further integrated into international technological systems.

²⁷ MATÁV, which rated second on the 1996 list of the top one hundred companies, employs 20,000 people, has sales of 192.5 billion HUF, and a 24 billion pre-taxation profit. It is a natural monopoly, and enjoys a concession that allows it to dominate the whole Hungarian market until 2002.

²⁸ This is described quite clearly by one of the subtitles of Imre Csorba's excellent PhD thesis: “*Privatization as a strategic alliance.*” (Csorba [1996] p.134.)

²⁹ The syndicate, bearing the name *Magyarcom*, was formed out of *DPB Telecom* and *Ameritech*.

³⁰ The shortage economy took rather extreme forms in this area. Using the terminology of Kornai, telecommunication was the reign of *postponing* and *negligence* for decades.

The networking of MATÁV has a significant positive *external effect* on the networking of other companies. The satisfactory development of telecommunication is a necessary condition for attracting investors and network partners - especially in the eastern part of the country. Without the existence of technology that permits the point person or point team to access all the information needed to serve the customer completely, the implementation of the network type organisation is unlikely (Quinn [1992] p.134.)³¹

The technical revitalisation of MATÁV was favourably influenced by its contact with an *international R&D network* named EURESCOM. EURESCOM is the association of 25 organisations that manage networks in 21 European countries. The association can be perceived as a strategic alliance to co-ordinate research within the industry over large geographical units. Hungarian developmental researchers commissioned by MATÁV have participated in joint research since 1994. (C.f. Pálkás [1996] p.86.)

The lighting company Tungsram³² has also successfully adapted to changes by joining General Electric. Although their “marriage” was not untroubled, the transformation of Tungsram is considered a success story.³³ This evaluation is even more valid if we analyse the effects its jointure has on the whole of the network, not merely its individual accomplishments. As Paul Marer and Vincent Mabel put it in their case study; “Tungsram was a strategic investment for GE. The better part of such investments often receive their returns through other units of the global company... Given time, the possession of Tungsram makes the parent company and its other daughter companies more effective and gives them a competitive edge, therefore making them more profitable. The total company profits are due to increased market shares³⁴, specialisation, Trans-national teamwork, R&D, technological advancement, and decrease of general expenses.” (Marer - Mabel [1996] p.11.)

Along with the appearance of multi-national companies came speculation that joining their networks would bring the level of production to a decline, since these empires would relocate inferior production processes to the countries of our region and retain “real” value-added activities within their centres. The Tungsram case proves the opposite. The largest industrial research centres in Hungary, employing 380 researchers, are in the framework of Tungsram. According to Iván Völgyes, Hungarian consultant of GE, the reformed research institute is already a formidable network-competitor of its sister-institute in Cleveland³⁵, since it delivers better results more efficiently. Tungsram’s

³¹ Cited by Jarvenpaa- Blake [1994] p. 25.

³² GE Lighting Tungsram, with 10,500 employees, a 62 billion HUF net sales and a 21 billion HUF pre-taxation profit, was rated 11th on the 1996 list of Hungarian companies. It is one of the oldest and most important Hungarian companies, founded in 1896. It’s research center, the Bródy Institute (named after its founder) was the most significant Hungarian industrial research center for decades.

³³ GE’s investment into Tungsram was the largest investment (about 600 million USD) in the post-socialist region. 90% of GE Lighting’s production is in Hungary, and approximately nine-tenths of its production is exported.

³⁴ Before Tungsram joined GE, the sum of their separate share of the market was 7-8% in Europe, this has doubled since.

³⁵ Out of the eight listed projects, 4 are conducted in the Nela-park GE Research Center, and 4 in the Tungsram Institute.

successful network integration is all the more remarkable since GE's expansion strategies are more based upon shocks³⁶ than slow evolution.

Foreign capital has a large role in the accommodation of the whole country, not only the survival of particular companies. One piece of data will suffice to underpin this. 73% (!) of Hungarian exports are from companies partly or completely owned by foreign investors.

The post-socialist network - swept along by global currents

The organisation of networks was in some cases initiated by Hungarian companies that waded out of their seemingly hopeless positions by "fleeing forwards".

Dunaferr³⁷ - a metallurgy and steel industry concern that is basically still managed by its former Hungarian management - is currently one of the most successful Hungarian companies. The present senior management of the company, who has been with the corporation since the 80s, reorganised its pre-system-change monolithic structure³⁸ into a network comprised of 40 member companies. The holding, following modern organisational trends, is a network-type establishment composed of a solar-company and dozens of satellite units integrated by it. "The big idea behind the transformation" as *Éva Voszka* describes it "was co-ordinating the loosening of frames while retaining methods of uniting the company group." (*Voszka* [1997] p.129.) *István Sófalvi*, information manager of Dunaferr, in his conversation with the author of this paper, also emphasised that the steel industry network "balanced the flexibility required by the market with the advantages of its size."³⁹ The fruitful networking of Dunaferr also serves to point out the lucrative results of academic-industrial Cupertino networks, as Dunaferr has been in close contact with renown university professors and researchers⁴⁰ in preparation for organisational reforms to suit the new conditions since the 80s.

Dunaferr is perhaps the best example of *organic networking*. It is not by chance that organic development began with organisations involved in *retailing trade or distribution*.⁴¹ The national market for the products of Dunaferr underwent a complete metamorphosis during the devastation of large companies. The formerly centralised

³⁶ GE prefers tightly-knit networks to loosely-knit ones. It completely assimilates its member companies, and does not consider local characteristics very important. "GE, as opposed to other multi-national companies who make an attempt at respecting cultural sensitivity, dares face accusations of arrogance." (*Marer - Mabel* [1996] p.17.)

³⁷ The company is still in the state property, but the management has taken it over for long-term property management.

³⁸ The networking of the company was not accomplished in a day, but was preceded by a gradual erosion of its monolithic structure in the days of the old regime. There were opportunities for organizing economic work groups and corporate economic work groups after the 80s. These functioned as a sort of profit-centers, and prepared the ground for the following decentralization and networking of the company.

³⁹ These advantages can be quite significant in transition economies, since if the companies had decided to form completely independent Ltds, we could not receive effectively any bank loans, could not be represented in lobbies- which is a political necessity for the prosperous functioning of even global companies...

⁴⁰ It is true for both Hungary and Dunaferr that universities and research institutes recognized as the suppliers of talent, are potentially well positioned to become the prime knowledge suppliers for companies.

⁴¹ The facts of the networking of Dunaferr were taken from an interview done by the author of this paper with *István Sófalvi*, information manager of the holding, on 14 July, 1998.

organisation had competently served a few giant customers, but did not know what to do with tens of thousands of customers. Remarkably, the decentralisation of its trade started from the bottom. A few independent distributors of Dunaferr steel established closer and closer Cupertino with the company giant. They eventually formed a chain that was seen by the management of Dunaferr, who later stabilised and institutionalised this spontaneously born organisation in the framework of Dutrade, a network that united these sporadic individual organisations, and gained shares in many of these new satellites.

The most recent network-innovation has also appeared in the company which has made the final decisions on establishing SSCs (Steel Service Centres) to make the final adjustments on their products according to the individual wishes of customers,⁴² thereby falling in with new world trends. SSCs will develop into regional centres and attain better customer service quality with the aid of a brand of *mass customisation*.⁴³ Outsourcing - as another network development - has also commenced at Dunaferr. Most activities that are not in the main profile of the company are farmed out. Power plants and lime kilns have been sold, and this is presumably the fate waiting for the company's information network as well. The retail trading network and the main activities will, however, be retained in the majority property of the company. It is quite exceptional, though, that a giant company in the possession of the Hungarian state managed to adapt to the most modern organisational and technical trends without any external aid.

The fact that Dunaferr was one of the first to use information technology greatly helped the networking of the company.⁴⁴ Information technologies obviously go hand in hand with networking, yet it is a typical Eastern-European paradox that the advantages of deriving from the same giant company were not really made use of in developing their information network. When Dunaferr was decentralised, the emerging member-companies and LTD's - overreacting to their newly-found freedom - developed their information systems completely separately from each other, and these later proved incompatible with that of others within the network. The standardisation of the information systems of network members was only initiated after a few years. Sizeable losses issued from the fact that they all invested into hardware and software independently instead of getting great reductions for ordering a larger amount. It was an even greater problem that the members of the network spoke different languages. Information could not be easily exchanged and

⁴² Unprocessed steel and tin is not marketable at all, but customized and processed, almost completely prepared for installation, according to the wishes of the customer, it sells well even in recession.

⁴³ Mass customization is a demand-oriented production system as opposed to former demand- or supply-oriented systems. The simplified model of the new system is that parameters, design, qualities of products are not determined in the factory along the lines of the designer's taste, but "remote-controlled" by the individual customer. Before the computerized assembly line is started, the individual orders are processed, and production means that, thanks to the variability made possible by computer technology, the number and additional qualities of the basic product are pre-defined and delivered with those exact parameters. To gain a picture of mass customization in real life, it is enough to contemplate the fact that the Motorola Bravo "beeper" factory in Boynton Beach, Florida is capable of producing 29 million (!) different versions of the same product. *Mass customization* is closely linked to *Toyotism*, it is in fact a repercussion of the Toyotist philosophy.

⁴⁴ The first giant Soviet computer center was installed in the company about *twenty-five years ago*, and this was enough for the establishment of computers despite this system's slowness and obsolescence.

summed up on higher levels and the Company therefore lost time⁴⁵ in company-level strategic reactions.⁴⁶

The management of the holding finally came to the conclusion of re-centralising the holding-level information system and standardising the information management of member companies. There is now an operative *Intranet* within the holding, with 550-600 users. A Management Information System has been co-ordinating holding-level decisions since 1992-93, which makes following significant economic data possible in the 26 member companies. However, even more ambitious plans to develop the Intra-net have surfaced; they want to standardise the documentation of data and develop standard rules to make data available, comparable and controllable in the whole of the network.

The prosperity of a telecommunication company based in Székesfehérvár called *Videoton* is a story of management success in Hungary as well. Videoton was ruined by the loss of the Soviet market as all of the similar-size companies were. After four years of agonising, it was finally pulled away from bankruptcy with the help of international production contacts.⁴⁷ The key to its success was that it transformed its former production sites into an *industrial park* leased to foreign companies. Emerson, Phillips, IBM and a number of other renowned companies have established their presence in Székesfehérvár due to their action. The smaller Hungarian LTD's that were born out of the decentralisation of Videoton entered subcontracting relationships. One of the largest accomplishments of Videoton was that it managed to join the production of parts for IBM PCs.⁴⁸ The strategy of the company was announced by Gábor Széles; "We have arrived at a point where we have successfully introduced the Videoton Group into the Western-European production Cupertino." The company is joining the value-chains of well-established multi-national industrial companies as a minor supplier. It must be emphasised that they are not contracted to do low-level production.⁴⁹ Through being sub-contractors, the members of the company group have integrated into developed, complex production processes. The Videoton Group has established a presence as a car-industry supplier as well as being subcontractors for entertainment electronics and computer-components producers. Western partners bring the needed technology, facilities and often even provide a market for Hungarian contractors. The products of Videoton are up to the highest international standards of quality. Through their efforts, a distinct type of company-network developed; the socialist giant company became a "giant contractor."⁵⁰ Although the Videoton Group

⁴⁵ The incompatibility of the computer systems deprived the network of what should have been the main function of an information network; the possibility to react and interfere at once.

⁴⁶ While global companies can generally produce a closing balance sheet report two days after the books were closed by its daughter companies the same procedure takes Dunafer two-three weeks.

⁴⁷ For a case history c.f. Sándor Faggyas's article "Tackling difficulties with the aid of many feet" (Kápé, 15 September, 1994)

⁴⁸ The most sensitive parts of IBM hardware, the miniscule reading-writing heads are manufactured by Videoton with the computer multi-national's technology, on equipment that was purchased on credit guaranteed by IBM. (Heimer [1998] p.102.)

⁴⁹ One of the companies leasing space in Székesfehérvár is IBM Storage Products Ltd, a typical assembly unit founded by the world's largest computer company, IBM during the fall of 1995. The engineers of a company that has become the industrial corporation with the largest sales in Hungary in a time span of two and a half years, have gained recognition for developments in production procedures. What's more, Hungarians are considered the principals of some innovation sub-spheres within 'the Big Blue.'-commented Gábor Papp, manager of the engineering department. (Heimer [1998] p.102.)

⁵⁰ I haven't seen any other examples of similar supplier giants in international literature.

is only the 64th on the 1992 list of Hungarian companies, it has become a company of a 20 billion HUF net sale producing a 756M HUF profit out of a heap of losses.

Small suppliers (subcontractors)

The best chance small and medium-sized Eastern-European companies have of joining the world trend of networking is to work as contractors. This rather obvious solution, however, was not easily⁵¹ implemented⁵² in Hungary. It did eventually become realised, and the suppliers that were born three-four years ago are developing dynamically. Suppliers integrated into their client's value-chains have begun taking up more ambitious tasks as well. "Austria and Albania are both suppliers in the network of international Cupertino. Our realistic choice would lie somewhere between these two models." commented András Inotai, director of the World Economy Research Institute. (Heimer [1998] p.102.) Multi-national companies did not trust unknown small and middle-sized Eastern-European companies on entering the region, and preferred to bring their own suppliers, firmly established in developed countries, to the "Wild East." However, rational economic considerations soon overcame prejudices.

The outsourcing wave⁵³ - the effort to have tasks performed on the lowest possible yet still competent level⁵⁴ - in developed countries is an advantageous factor for Hungarian entrepreneurs in gaining the status of suppliers.

The medium-sized Mezőgép is a supplier for the French Peugeot, the American Ford, General Motors (GM), and indirectly - through the parts producer Austrian Steyern - for German factories as well. As it would be extremely expensive to import the seats for Suzuki's from Japan, Japanese investors also negotiated a contract with a parts-factory of Ikarus, that produces similar seats for Hungarian buses. The independent IMAG Kft. was therefore formed in 1992, and has become the largest production unit of the 40 suppliers of the Suzuki factory in Esztergom.

Sokoró Ltd. in County Győr-Moson-Sopron is a regular supplier of cables for Mercedes. This giant car-producer periodically performs quality control, and the products of this small Ltd. were rated 98 on a scale of 100 at one of the last controls. Supply networks educate companies in production culture, and transmit technical knowledge as well as a sensitivity towards quality. Opportunely, the largest flow of knowledge through supply networks is concentrated to the areas where the lack of knowledge is most pervasive, which is quite beneficial for development. For example, a German car-production company set joining the EDI⁵⁵ as a condition for negotiating a contract with a Hungarian

⁵¹ The low level of socialist production culture frightened many foreign investors away in the first few years after the systemic change. Their fears and prejudices prevented them from contracting out some of their sub-functions to companies in the region.

⁵² Many Hungarian companies are reserved regarding suppliers status, as they consider it as a kind of subordination. Of course, it cannot be said that giant international companies never exploit their size advantages, and take suppliers as equal partners in their transactions. Nevertheless, if we look at it objectively, the key to the success of a number of companies lay in their supplier status .

⁵³ This phenomenon is treated more extensively by *Fenestra - Hanson* [1996], *Earl* [1996], *Withington* [1993] and the author of this paper, *Szabó* [1998].

⁵⁴ This is the so-called subsidiarity-principle.

⁵⁵ Electronic Data Interchange

parts-supplier. The Hungarian company eventually opted for meeting the requirements and adapted their production processes to the standards.

The suppliers in the country often state that they have to severely depress their prices in dealing with multi-national companies. The above mentioned IMAG LTD's car-seats are still priced what they were in 1992 (!), but is paid for its products in HUF that had the exchange rate of 80HUF/1USD back then and are exchanged at 210HUF/1USD today. (Tevan [1998] p. 117.) Nevertheless it is quite probable that without such pressure, small and medium-sized Hungarian companies would never reach international standards and would have an uncertain future before them.

“Intelligent companies” - in Hungary

It might be surprising at first, but companies that are usually thought of as twenty-first century corporate formations have appeared in Hungary as well. One of the most interesting types of the above are the so-called '*intelligent companies*.' This term usually covers knowledge-industry companies that base their whole existence and range of activities on one original intellectual innovation or radically new technology. These organisations do not invest into material capital that quickly becomes obsolescent, instead, as a leader of an American company put it, “They invest in people having clear and viable conceptions...who focus their interior energies to that handful of key-activities which are really unique and value-increasing” (Quinn [1992] p. 49.) The mentioned companies are more open towards networks than traditional industrial organisations precisely because of their knowledge-intensive activities.

A classic example of Hungarian intelligent companies is Graphisoft, founded under the former regime in 1982. The company established contacts with Apple Computer directly after its birth. Apple suggested that the Hungarian software-developer produce architectural design software with the aid of their previously gained experience in designing programs that dealt with three-dimensional pictures. Graphisoft's most important product is ArchiCad, a design software for use in architecture. “With ArchiCad, you can view the interior of a cathedral from the viewpoint of the member of the congregation sitting in the last row or from the vantage of the priest celebrating the mass while still being able to freely move and look around. At the moment, only our design program is capable of this,” commented Gábor Bojár, founder of the firm.⁵⁶ (Siposs [1995] p.20.)

The company's success is due to the fact that it found the appropriate segment of the market for its product - smaller architectural and design studios. These studios do not have the funds to purchase multi-million HUF design programs they would not even be able to utilise in their two-three person offices. Micro-architectural firms need software for small studios and small-capacity computers, and ArchiCad is absolutely suited for these requirements. This intellectual product of the company is now available in 18 languages⁵⁷

⁵⁶ Graphisoft's architectural program ArchiCad version 4.5 won the American MacUser magazine's 1994 Eddy-award. This considerable award was never before given to a non-American software company.

⁵⁷ The fact that the design programs of Graphisoft speak the languages of the countries they are sold in is an incomparable edge in competition. “The Japanese are open people, but they are bound to their traditions. We couldn't sell any programs before they began speaking Japanese. Not to mention the fact that the architectural traditions and technologies are different in Japan” commented the director of the company. (In: László Dalia: “Even Graphisoft is off to the East”) (Kápé, 14 March, 1996.)

in 65 countries, and approximately 16,000 architect's work with the program from North America to Asia. (*Pálinkás* [1996] p.102.)

Graphisoft, however, does not lean back and enjoy the market success of its product. It is amongst one of the few Hungarian companies that organise networks abroad and establish their own daughter companies; it has daughter companies in Munich, San Francisco and Tokyo. It also has an intensive Cupertino established with Apple. Through joining its retail trade network,⁵⁸ they have seen how distribution works in a global company from the inside, and have made use of their experiences in dealing with their own independent distributors in Botswana, Korea, or Australia. (*Siposs* [1995] p.19.) A great advantage that Graphisoft has is that while for example, American companies only know their domestic markets, Graphisoft originates from a small Eastern-European country that is necessarily multicultural and thus much more flexible. Since flexibility and the knowledge of local and regional markets is extremely important in network capitalism, this is an considerable competitive edge.

The fact that intelligent companies are proliferating in Hungarian economy is quite promising. Most of these are small, independent companies under Hungarian ownership, only a few are owned by foreign investors. ERICSSON Ltd, registered in Hungary in 1990, is one of the most prosperous of the latter, consistently rated one of the first three out of the 29 software-developers within the Swedish-based global company. (*Pálinkás* [1996] p.87.) The company had a 27M HUF turnover last year, it employs now more than 600 people, and one-third of the employees - who are generally in their twenties - is involved in the development of telecommunication-related software. "The value-producing_capacity of a Hungarian software developer can be 12-15 times larger than a hardware designer's," stated István Fodor, Managing Director of Hungarian Ericsson. "While Hungarian political economists still think in 'boxes,' that is hand-set production," he added, "we have established a separate software development centre within the company in the 90s, where we have developed - among others - the programs that make it possible for companies to avoid having to constructing individual substations for the telephone system of the company; this task is dealt with by the central corporate digital telephone centres, and the parent company itself is offering our system everywhere in the world." (*Heimer* [1998] p.103.) The Finnish Nokia, known to everyone from the prevalent mobile-mania, has recently announced the establishment of a new development centre in Budapest that will employ approximately 530 people to conduct basic and applied research for software production. (HVG, 28 February, 1998)

In summing up the experiences of companies greatly different from each other yet similarly successful in networking, the following conclusions can be arrived at:

* The Schumpeterian "creative destruction" is perceptible in the development of each company. Network-type solutions are often established on the ruins of a monolithic company. Development is also commonly determined by "*recombinant system*

⁵⁸ Graphisoft signed a distribution contract with Apple in 1990, and it actually joined the network and entered the circles of Apple with this step.

*elements*⁵⁹ of previous configurations reorganised in a new form. Therefore it would be misleading to consider the remains of traditional Hungarian organisations merely as destructive forces. The “genetic inheritance” of socialist companies does not consist only of malfunctioning, “deformed” genes, but also of *mutants* that are capable of development and adaptation.

* There seems to be a strong correlation between organisational reform and technical innovations in companies entering or forming networks. Companies opting for network solutions have a great inclination to introduce technical-technological innovations and vice versa the utilisation of a basic technical innovation requires companies to be capable of thinking in forms other than the traditional organisation.⁶⁰

* Informatization plays a role in most of the above mentioned cases; it is either the main actor, a supporting actor or the connecting medium. The hypothesis that the successful adaptation of countries at the level of Hungary is only possible with the aid of information technologies is thereby proved.

* A new approach to the market is prevalent in all of the above cases, regardless of whether they were Hungarian or international networks. Under “new market orientation,” or “new market-oriented activities”, we refer to organisations that first of all react to the challenges of the market dynamically and energetically, secondly that they want to produce what they can sell, and not want to sell what they can produce. Under market closeness we also refer to the fact that the analysed companies are capable of anticipating the markets wants and needs, and can pre-articulate the customers’ requirements. It is also a repercussion of the above approach that these companies are in constant and close contact with their customers, even providing 24-hour customer service if needed.

* International elements are also present in almost all of the organisations in successful network relationships. Joining or being suppliers for Trans-national companies are only two examples for this. Companies of Hungarian origins are increasingly forced to take an international view. Their markets, their Cupertino partners, or their innovations force companies to take a wider view that is not restricted to Hungary.

* The passivity of the state in networking is quite conspicuous. It can be stated without exaggeration that networking is happening without any outside aid or subsidy from the state. This is partly a good sign, as it means that the market leading companies are capable of surviving and integrating into world economy on their own. On the other hand, this points at the boundaries of the processes in the light of international experience.

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⁵⁹ On recombinant elements arranged into new formations as a typical phenomenon in transition economies, c.f. David Stark’s very interesting essay. (Stark [1994])

⁶⁰ This is pointed out by the relationship between *Graphisoft* and *Apple*, but there are other examples as well.

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Promoting Industrial Networks: Learning from Policy Evaluation – The Case of USNet

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Abstract: The insights and findings of the evaluation study discussed in this paper probe the value, performance, and impact of explicit public policies and programs to promote inter-firm knowledge transfer and networking, using a US case.

Acknowledgments: This paper draws on individual USNet evaluation studies by members of the USNet evaluation team, under the direction of the author. Special acknowledgements are due to Jan Youtie, Mary Alabanza Akers, Gordon Kingsley, Eric Oldsman and Doug Welch for their contributions to these USNet evaluation studies.

1. Introduction

Recent research that has emphasized the role of flexible inter-firm networks in technological innovation and regional economic development has had significant effects on technology and business promotion policies and programs. In a variety of locations, new policy and programmatic interventions have been initiated to foster enhanced industrial networking to strengthen information flows, business collaboration, industrial performance, and economic development.¹

The policy logic for the development of inter-firm promotion initiatives revolves around three linked notions. The first is that firms engaged in inter-firm collaboration and networking are typically more productive, innovative, and successful than less interactive firms.² The second idea is that intermediary organizations and infrastructures, including network groups, industrial associations, business support organizations, research centers, and educational institutes, can perform critical roles in facilitating inter-firm collaboration. The third assumption is that public policy can strengthen industry and organizational

¹ For example, see Frank Pyke, *Industrial Development through Small Firm Cooperation*, International Labor Organization, 1992; Philip Shapira, "Collaborative Business Exchange and Technology Fusion: The Japanese Approach," *Firm Connections*, September/October, 1994, pp.10-12; Mark Dodgson and John Bessant, *Effective Innovation Policy: A New Approach*, London: International Thomson Business Press, 1996.

² Authors that have advanced this argument include Michael Porter, *The Competitive Advantage of Nations*, New York: Free Press, 1990; and AnnaLee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Cambridge, MA: Harvard University Press, 1994.

attitudes and capabilities related to inter-firm collaboration through enabling policies, awareness building, specific incentives, and other measures.³

For all three of these concepts, information, knowledge transfer, and learning are fundamental elements. Effective strategies and methods for acquiring information, refining or creating knowledge, and learning are the building blocks upon which technological and organizational innovations in products and processes.⁴ While internal systems that can undertake these tasks are crucial, firms can draw on external sources. Indeed, many have argued that exchange and interactive relationships with other firms and organizations are increasingly important given structural changes in industrial organization and the complexities of the technological, market, and business environments that firms now face. Similarly, it has been suggested that business groups, other organizations, and the public sector all have vital roles to play not only in offering specialized services, but also in creating networks and frameworks to facilitate knowledge diffusion.⁵

One recent policy initiative to promote inter-firm collaborative capabilities in the United States is USNet. This pilot program was comprised of a consortium of state-based manufacturing assistance organizations (or “partners”), along with the Manufacturing Extension Partnership (MEP) of the National Institute of Standards and Technology (NIST) in the United States Department of Commerce. Federal sponsorship for USNet was provided under the US Technology Reinvestment Project (TRP). Federal funds were matched by state and local funds and in-kind contributions provided by each partner. Regional Technology Strategies, Inc. (RTS), a nonprofit development organization served as the USNet manager.

USNet aimed to build the capacity of its state partners to promote inter-firm collaboration, with the ultimate aim of enhancing the competitiveness of small and mid-sized manufacturing enterprises. Between 1994 and 1997, USNet provided services to partners in 15 US states that targeted this objective, including strategic planning, training, executive briefings, resource and marketing materials, and technical assistance and challenge grants to particular networks.

A parallel evaluation component was established to monitor USNet’s performance, track its impacts, and identify lessons and best practices that could be used to improve the promotion of inter-firm collaboration. This paper reports on the design, principal findings, and conclusions of the USNet evaluation study.

2. Overview of USNet

The mission of USNet was “to build the capacity of its partners to promote inter-firm collaboration that strengthens and accelerates the competitiveness of small and medium-

³ Stuart Rosenfeld, *Industrial-Strength Strategies: Regional Business Clusters and Public Policy*, Washington, DC: Aspen Institute, 1995.

⁴ Knut Koschatzky, “Innovation Networks of Industry and Business-Related Services – Relations between Innovation Intensity of Firms and Regional Inter-firm Cooperation,” Fraunhofer Institute for Systems and Innovation Research, October 1998.

⁵ Dodgson and Bessant, op.cit.

sized manufacturers.”⁶ In its initial TRP proposal, USNet sought to provide six specific types of services to upgrade state capacities to promote inter-firm collaboration. These services comprised technical assistance, training, the development of learning groups, information and resources, assessment tools and performance metrics, and assistance with international connections. Services were to focus on a consortium of ten partner states, with the aim of fostering up to ten networks per year per state, or about 300 networks each involving 20 to 25 firms over the life of the project. Targets were set for related goals, including the number of people completing broker training, requests for clearinghouse information, and the use of networking techniques among industrial extension agencies.⁷

As the project began to get underway, it was soon realized that USNet’s quantitative goals were too ambitious for the resources available and needed to be recast. Also, it turned out that the states involved in the project were at disparate stages in the process of developing capabilities for inter-firm collaboration, and that each state had distinct and different needs. Rather than a broad multi-state approach, USNet subsequently worked with each individual state to develop customized activities and projects within the six categories of service defined by the proposal.

Ultimately, fifteen states participated in a formal way with the USNet project.⁸ USNet’s principal activities with these state partners occurred over roughly a three-year period from mid-1994 through to the end of 1997. In the project’s first year, there was an emphasis on customized strategic planning with state partners and on the design and delivery of training programs (“Foundation Forums”) to foster an increased understanding of inter-firm collaboration. In year two, there was a continuation of training services and strategic planning assistance, with additional thrusts to provide technical assistance to particular networks, briefings for company executives, and resource and marketing materials. In year three, USNet emphasized firm-level services, through challenge grants to individual networks, technical assistance, and tool-kits and case studies to assist in network development. USNet also continued to offer training and basic capacity-building services.

USNet’s cumulative three-year federal funding was a relatively modest \$973,000. In year 1, a 50 percent match was required from the state partners, which rose to 60 percent and 70 percent in years 2 and 3 respectively. Each state contributed approximately \$25,000 per year of membership plus in-kind funds, with this amount then matched by federal TRP funds, based on the allowable ratio. The total of federal and state funds, including state cash and in-kind contributions, to USNet over three years was about \$2.4 million. Each state was able to draw on a federally augmented individual “state account” to fund specific USNet services and activities. Some state and federal funds were allocated to USNet development costs and general activities.

⁶ Regional Technology Strategies, Summary and Response to the USNet Meeting in Washington on April 27, 1994, memo, May 19, 1994.

⁷ Regional Technology Strategies, Inc., *USNet: An Enabling Service for Manufacturing Networks*, Proposal submitted to the Advanced Research Projects Agency, Technology Reinvestment Project, July 1993. See especially page 21.

⁸ Organizations from these states participated in USNet: Connecticut, Delaware, Florida, Illinois, Kentucky, Louisiana, Massachusetts, Minnesota, New York, North Carolina, Oklahoma, Oregon, Virginia, Washington, and West Virginia. Some states participated for less than the full three years.

3. USNet Evaluation Design

USNet established a parallel evaluation element. Evaluation was directed to track USNet's activities and assess the performance and impacts of the program. Additionally, the evaluation component was designed to strengthen and advance strategic learning about inter-firm collaboration. The intent was to apply scarce evaluation resources to better understand inter-firm collaboration and its motivation, organization, and impact – and to feed this knowledge back into policymaking and network development strategies.

As part of this multiple-approach, the USNet evaluation effort was structured around three themes:⁹

1. *Effectiveness of USNet activities and services.* We wanted to assess the performance of USNet in delivering training, technical assistance, shared learning experiences, tools, and other services to its principal partners, the member states.
2. *Impacts on partner capabilities, services, and policies.* Here, we examined the extent to which USNet built the capabilities of its partners states and organizations to promote inter-firm collaboration through industry-driven services and supportive policies.
3. *Impacts on collaborating small and mid-size firms.* We were concerned to learn more about why firms became involved in inter-firm collaboration and to probe the effects of collaboration on firms' business strategies, competitiveness, and economic performance.

Probing these themes was essential to understanding the benefits, costs, net impacts, and policy lessons from efforts to build capacity for inter-firm collaboration. Yet, at the same time, it was recognized that the kinds of evaluative questions raised by the themes noted above would be intrinsically difficult to answer. For example, many factors influence how states structure their business and economic development strategies, and USNet had relatively few resources at its disposal to influence such decision-making. Since USNet was a small initiative, it was not realistic to expect massive results. Moreover, the evaluation was complicated by the fact that USNet was itself an intermediary organization. It delivered services to geographically and industrially diverse partner states and organizations. This meant that impacts at the level of firms, local economies, and state policies could only be achieved if those partners subsequently acted. Nonetheless, we did hope to identify insights that could be useful to USNet members and stakeholders and to the broader communities interested in inter-firm collaboration and economic development.

Several different measurement and evaluation methodologies were used. We tracked the activities and services that were delivered, observed the partners learning network meetings, and conducted end-of-session assessments with trainees and trainers at USNet Foundation Forums and other training events. These end-of-session assessments provided immediate feedback on trainees' satisfaction and learning and on their implementation plans. We also completed two follow-up studies of Foundation Forum trainees to assess the longer-term effects of training on participant's organizations and efforts to promote inter-firm collaboration. Case studies were undertaken of special USNet projects, including technical assistance to specific states and challenge grants. A benchmark survey

⁹ Philip Shapira, *USNet – An Enabling Service for Manufacturing Networks: Evaluation Strategy*, USNet Evaluation Working Paper 9401, June 1994.

of participating states was conducted at the start of USNet in 1994; a second state benchmark was completed early in 1998, at the end of the federally sponsored USNet project. This helped to measure changes and developments in state policies and programs for inter firm collaboration during the period of USNet's operation. We also sponsored a meta-case analysis of more than 120 case studies of industrial networking. Finally, we conducted our own study of network brokers and network member companies, to provide information on the organization of inter firm collaboration and the business impacts associated with it.¹⁰

Deliberately, these methodologies employed a mix of quantitative and qualitative measures. As necessary, we pioneered new tools, as with the survey of network member companies. Plans and methods for individual studies were discussed at meetings of the USNet Partners' Learning Network and included in the annual operating plans submitted to NIST. As they were completed, individual studies were made available to USNet partners and to other interested parties. Presentations on the results were again made at meetings of the USNet Partners' Learning Network, NIST annual reviews, and at other meetings involving evaluators and policymakers. Dissemination also occurred through Firm Connections (particularly a special issue on the evaluation of USNet, published in December 1997) and the worldwide web. Additional publications are planned.

The implementation of the USNet evaluation element involved a networked group of evaluation specialists from three different organizations – Georgia Institute of Technology, the University of Georgia, and Nexus Associates, Inc., under the direction of the USNet evaluation coordinator (the author of this paper). Different combinations of members from this group contributed to particular studies. In following sections, the findings of the major USNet evaluation studies are discussed, beginning first with the USNet Foundation Forum.

4. The USNet Foundation Forum – Effectiveness and Outcomes

The Foundation Forum program was a USNet education and training initiative for presenting the fundamentals of inter-firm collaboration and network formation. Between November 1994 and October 1997, nearly 700 participants attended USNet Foundation Forum workshops and associated Executive Briefings. These participants represented public agencies, economic development organizations, manufacturing extension programs, educational institutions, private consulting firms, and business enterprises.

Some thirteen of the USNet workshops were “full” Foundation Forums, targeted mainly to business assistance providers, extension agents, and network program staff. These were offered for at least a full day and, in six cases, extended for a second day of hands-on planning. Four other shorter events were held (usually for about one half of a day), targeted at business executives and program managers.

The Foundation Forum was designed as an introductory course that presented the fundamentals of inter-firm collaboration. Each Forum offered a conceptual framework for thinking about inter-firm collaboration, an inventory of the resources and methods available for forming networks, information and materials on how to communicate inter-

¹⁰ The individual studies on which this paper draws are available and published separately. A full listing and many of the studies can be obtained in an electronic document format through the worldwide web at <<http://www.cherry.gatech.edu/ifc>>.

firm collaboration with small manufacturers, and examples of existing inter-firm networks. There was some customization of the curricula and content of each Foundation Forum event, although most events included seven core items: (1) What is inter-firm collaboration? (2) What are the benefits of inter-firm collaboration? (3) Network mind-map. (4) Case studies of inter-firm collaboration. (5) What role can I play and what resources are available? (6) Key opportunities and barriers. (7) Action steps. The Forums were usually planned and taught by experienced outside consultants, working with RTS staff and the local co-sponsor. Owners and managers from businesses engaged in industrial networking were involved as presenters in several of the sessions.

Two different types of evaluations were conducted of the USNet Foundation Forums. First, at the end of each workshop, participants were given an end-of-session questionnaire to provide immediate feedback. Lead instructors at each workshop were also asked to provide their own views, in writing. Second, we conducted longer-term follow-up assessments with Foundation Forum participants, at about 6 to 18 months after participation. We anticipated that – at the end of the training session – participants might over-estimate the actions they would pursue as a result of Forum participation. Our longer-term follow-up allowed sufficient time to elapse for the actual impact of the workshop participation to be realized. We conducted two follow-up studies, focused on the thirteen full Foundation Forum workshops. One study, which was completed in November 1995, followed-up on a first group of six Forums. The second study, completed in October 1997, follow-up on a second group of seven Forums. The results from the end-of-session and follow-up studies are considered in the following sections.

4.1 Foundation Forum End-of-Session Assessments

A questionnaire survey was implemented at the end of each forum and workshop session. For the thirteen full Foundation Forum workshops, questionnaires were returned by 339 of 568 participants, a response rate of 59.7 percent. Analyses of returned questionnaires were conducted for each full Foundation Forum and for Executive Briefings, with individual feedback reports provided to Regional Technology Strategies, lead trainers, and local co-sponsors.¹¹

The responses from the survey provided a profile of the Foundation Forum attendees.¹² Public agencies or economic development organizations employed more than two-fifths of the participants. About one-fifth of the participants were from manufacturing extension programs.¹³ Nearly as many (18 percent) of the participants were from private consultants, businesses, or industrial associations.¹⁴

About one-half of the participants were recruited to attend the Foundation Forum through their employing organization, generally as a result of outreach conducted by the local co-sponsor (or, in several cases, through attendance by staff members of the co-sponsor). Recruitment through flyers, advertisements, or direct mail and through colleagues or contacts in other organizations each stimulated a further one-fifth of enrollments. The

¹¹ Philip Shapira and Jan Youtie supervised the end-of-session evaluations of the Foundation Forums, including survey design and analysis. Krassimira Paskaleva assisted in initial data entry.

¹² Results reported in this section are for the 13 full Foundation Forums, where consistent data is available.

¹³ Scaled up to the 568 participants, this result implies that around 120 manufacturing extension staff participated in USNet Foundation Forums. In addition, a further unspecified number of participants were employed by public and private sector affiliates of manufacturing extension organizations.

¹⁴ Business participation was greater in the Executive Briefings.

majority of participants (82 percent) described their prior experience with inter-firm collaboration as low to medium.

Generally, participants viewed the Forums as useful training sessions. On a 1 to 5 (low to high) scale, participants rated the trainers at 4.1 – a favorable assessment. Individual Forum topics that dealt with case studies and practical issues or that introduced manufacturers engaged in networking were among the most highly rated sessions. Where second-day hands-on sessions were offered, these were mostly viewed positively, although some respondents felt that one day would have sufficed.

Respondents were asked what actions they were likely to take as a result of participating in the Forum. Most respondents replied that they would try to establish inter-firm collaboration among specific groups of companies (mean score of 4.0) and promote improved policies or program for inter-firm collaboration (mean score of 3.7). Slightly fewer respondents indicated that they would request further training (mean score of 3.4).

Overall, USNet's Foundation Forums achieved the objective of promoting awareness of inter-firm collaboration among a relatively large number of individuals and organizations in participating states. Industrial extension personnel were represented among the participants, although other business assistance and economic development organizations were also appropriately represented. End-of-session evaluations were mostly favorable, with the majority of participants prompted to consider subsequent actions to promote inter-firm collaboration in their localities.

4.2 The Foundation Forum Follow-up Studies

While the end-of-session evaluations of the Foundation Forum's were mostly favorable, the true impact of these training events can only be assessed after some time has elapsed. Good training sessions motivate and enthuse, so it is to be expected that participants will over-emphasize their likelihood of acting and minimize the real barriers they face. In addition, once participants get back to their home organizations, they may find that existing or new organizational priorities take precedence over their plans to promote inter-firm collaboration.

For such reasons, we judged that we needed to undertake post-session follow-up evaluations with Foundation Forum participants. A significant period needed to pass so these participants could make a more measured assessment of what they had gained from the Forum and what actions had resulted. Two follow-up evaluations were undertaken of particular Forums, the first in 1995, and the second in 1997. Similar questions were asked in each follow-up study, although selected questions were posed differently and there were distinctions in sample design and stratification (discussed below).

4.2.1 Study Methodologies

The first follow-up study evaluated the impacts on participants of Forums conducted in New York, Massachusetts, Washington, Connecticut, Oklahoma, and Louisiana in 1994 and 1995.¹⁵ The evaluation was conducted by telephone interviews with participants six to ten months after their attendance at a Foundation Forum. Lists of those attending the Forum were provided by the state programs that co-hosted the event. We hypothesized

¹⁵ Gordon Kingsley, *Establishing the Building Blocks: A Follow-up Evaluation of USNet's Foundation Forums on Inter-firm Collaboration*, USNet Evaluation Working Paper 9504, November 1995.

that the training was likely to have a large impact on small number of individuals but modest impact for most others. It was thus important to ensure that we identified and interviewed the “high impact” participants. So, the respondent lists were stratified in that the state programs were asked to nominate five individuals attending their Forum who were likely to have had a positive learning experience. Another set of respondents was randomly drawn from each state. The research design sought a set of five nominated respondents and five randomly drawn respondents for each state.¹⁶ While this was not achieved, complete interviews were conducted with 47 people. Of those 27 were from nominated individuals and 20 were from those randomly selected.¹⁷

The second study gathered participants’ feedback about the impact of workshops held in Delaware, Florida, Illinois, Minnesota, North Carolina, West Virginia, and Wisconsin in 1996 and 1997.¹⁸ Forty participants were interviewed by telephone. For the purpose of comparison and impact analysis, the respondents were stratified into two groups: participants who were associated with MEP affiliates and those associated with other groups. Eighteen of the 40 respondents (or 45%) were MEP-associated. The following sections discuss the main findings from the two studies.

4.2.2. Awareness, Usefulness, and Changes in Attitudes

Both Foundation Forum follow-up surveys sought to determine the longer-term impacts on participant awareness about inter-firm collaboration. The surveys also assessed whether participation in the Forum had changed participants attitudes towards inter-firm collaboration.

The Forums were designed to present the fundamentals of the topic, although it was apparent that participants with varying levels of prior experience had been attracted to attend. In the first follow-up study, nearly two-thirds of the respondents (29 out of 47) had been involved in either the promotion or formation of a network of small manufacturers prior to the Forum.¹⁹ The prior experience level was lower in the second group of Forums, where about two-fifths of the 40 respondents mentioned that they had heard or read a little about inter-firm collaboration prior to Forum participation. Of the ten individuals who had prior networking experience, six (60 percent) were MEP-associated.

Respondents mostly gave positive feedback on the quality and usefulness of the information presented at the Forum workshops. The respondents interviewed in the first study were generally satisfied with the quality of presentations (giving a mean score of 4.0 out of a maximum of 5.0). This study observed that “respondents clearly remembered and understood the terminology and the philosophy of networking that had been presented”. However, the appropriateness of the curriculum was less highly regarded (mean score of

¹⁶ The first objective of this research design was to capture best cases, i.e., individuals that sponsors felt received the greatest impact from the training. This permitted a test of the hypothesis that training had at least a significant impact on a few people. The second objective was to provide a comparison group of other (“typical”) participants, whose experience might be compared against the best. This permitted a test of the hypothesis that the impact of the training was more broadly dispersed.

¹⁷ The first follow-up study also assessed feedback from trainers and state sponsors.

¹⁸ Mary Anne Alabanza Akers and Philip Shapira, *Inter-Firm Collaboration to Improve Competitiveness: An Evaluation of USNet's Foundation Forum Workshops*, USNet Evaluation Working Paper 9702, October 1997.

¹⁹ Several of the states, including Connecticut, Massachusetts, and Oklahoma, in the first group of USNet Foundation Forums had pre-existing programs to promote inter-firm collaboration.

2.9 out of a maximum of 5.0). Several of the more experienced respondents in the first group of workshops reported that the level of information was pitched too low for their needs. This was much less of a problem in the second group of workshops. Thirty-eight of the 40 respondents in the second group reported that the knowledge gained at the Forum was either moderately or very useful in their jobs. Only two respondents admitted that the information given at the workshops was not useful at all.

Most significantly, there were positive changes in attitudes toward inter-firm collaboration because of the Forum. Among the first set of respondents, the Forum prompted a positive shift in enthusiasm towards the concept of inter-firm collaboration (table 1). Before the Forum, 25 out of 47 respondents (53 percent) were enthusiastic about the concept. After the Forum (and after several months had elapsed), 34 were enthusiastic (72 percent). A similar result was found among respondents to the second survey (although the question was worded differently). Some 17 of 40 respondents (43 percent) had very positive attitudes towards inter-firm collaboration prior to Forum participation. This increased to 24 respondents (60 percent) after Forum participation. Analyses were conducted to determine whether MEP-associated participants had different attitudes compared to those from other organizations. No significant statistical evidence was found.

Overall, the responses from both follow-up surveys indicated that the Foundation Forums increased understanding of the concepts and practice of inter-firm collaboration, despite concerns among some experienced participants that parts of the Forum were introductory.²⁰ Participants' attitudes towards inter-firm collaboration also became more positive due to Forum participation. The next section examines whether these positive changes in understanding, awareness, and attitude were translated into action by Forum participants.

4.2.3. Impacts of the Forum

The follow-up studies examined the extent to which Foundation Forum participation had resulted in participants taking subsequent action. First, to probe the diffusion of information obtained through the Forum, we asked whether participants had informally discussed the Forum with others or had made formal presentations on what they had learned. Second, to determine resultant changes, four categories of impacts were probed: actions within the participants' organizations, effects on government policy and programs, effects on trade and business associations, and effects on relationships with small and medium enterprises.

Forum participants frequently used what they had learned at the Foundation Forum in informal and formal communication. As might be expected, Foundation Forum participants most frequently discussed the Forum informally with co-workers. However, four out of every five respondents reported that they also had discussed the Forum informally with small and medium-sized manufacturers – a very positive result. Informal discussions with government officials and trade associations were undertaken by around 60 percent of participants. There was a lower level of formal presentation drawing on what had been learned at the Forum. Nonetheless, two out of every five respondents reported that they had made formal presentations to small and medium-sized manufacturers. Relatively few formal presentations were made to government officials. Indeed, five times as many respondents made formal presentations to manufacturers than

²⁰ Respondent comments about the strengths and weaknesses of particular Forum elements are reported in detail in the full studies.

to government officials, suggesting that the Forum material was most useful in helping practitioners explain inter-firm collaboration to firms.

Participants were asked about actions or activities they had undertaken as a result of the Forum (see table 2):

- Over two-fifths of respondents (44 percent) reported changes in their organizations' work programs. Other respondents mentioned that their organizations were already engaged in networking prior to attending the workshops (thus, changes in work plans were not necessary). Participants were also asked whether their organization was engaged in specific networking activities that were prompted by the Forum. Almost two thirds of respondents reported that they were undertaking initiatives to promote inter-firm collaboration, with nearly one-half engaged in identify candidate firms for networking. Respondents rather less frequently reported undertaking data collection or network training programs.
- Respondents were asked about the type of changes they had requested from government agencies or elected officials to promote network activities. About one-third of respondents had sought additional resources or increased service coordination, while about one-fifth had pursued changes in agency work plans. Only a handful of respondents sought changes in state policy. Participants in the first group of Forums were rather more likely to seek government support (this result may reflect the greater representation of industrial extension practitioners in the second survey sample).
- Participants were also asked about activities related to inter-firm collaboration with trade and business associations that were prompted by the Forum. The most common activity was promoting inter-firm collaboration among association members, reported by 37 percent of respondents.
- Significant impacts on collaborative activities of small and medium-sized enterprises were reported by Forum participants. Many respondents initiated activities with firms after the Forum. They identified candidates for networks (49 percent), distributed information on inter-firm collaboration (48 percent), and formed or were in the process of forming networks (31 percent). Initiating a training program was an infrequent response. Among respondents to the second survey, those involved in network formation were likely to be MEP-associated participants.

4.3 Foundation Forum: Observations and Recommendations

The combined results of end-of session evaluations and the two follow-up studies generally showed that participants benefited from the Foundation Forum workshops in terms of learning more about inter-firm collaboration. There was also considerable dissemination of information acquired at the Forum to others, particularly through informal communication. The subsequent application of networking concepts was more varied. Participants and their organizations were prompted to increase initiatives to promote inter-firm collaboration, including identifying candidates for networking and distributing information about networking to firms. Modest impacts were reported in leverage change with other government agencies and with trade and business associations.²¹ Nonetheless, some efforts were made to increase resource allocations and to improve the coordination of service providers.

²¹ This finding is consistent with the mix of participants at Foundation Forums, who tended to be more interested in providing business services than changing policy, and the content emphasis in the sessions on forming networks.

Respondents provided a series of suggestions to improve future Forums. The most commonly cited suggestions related to the content of the workshops. Several respondents suggested additional topics, such as how to secure cooperation from firms, practical aspects of getting started with a network program, and how to solve typical problems of network activities. Some would have liked to hear more from presenters who were actual network facilitators and members of successful networks. Others recommended that the application of inter-firm collaboration be geared to small home-based businesses, service sectors firms, rural communities, and economic development organizations (as well as small and mid-sized manufacturers).

USNet was advised (in the first study) to review the match between Foundation Forum content and participation, to avoid some of the concerns by more experienced participants over the curriculum.²² Both studies also recommended attention to the length of the Forum. In the second set of Forums, there was greater use of two-day events. Although trainers provided us with very positive feedback on these two-day Forums, we did not find any significant difference between the number of days attended and the way respondents used the knowledge in their jobs

Overall, we found that the Foundation Forums effectively introduced the fundamental concepts of inter-firm collaboration to a large number and a wide range of participants. The Forums clearly addressed an area where there is a much interest and great demands for learning about how to successfully promote inter-firm networks. Even those with some disappointments about the Forum expressed strong desires for more information. However, most participants indicated favorable attitudes, and many reported that they were subsequently prompted to act on what they had learned at the Forum.

5. Business Consequences: Impact of Inter-Firm Networking on Firms

The immediate aim of USNet was to build the capacity of its partners to promote inter-firm collaboration, through activities such as the Foundation Forum discussed above. However, USNet's partners and sponsors recognized that the ultimate tests of efforts to promote inter-firm collaboration were the effects on business performance, competitiveness, and industrial communities. It was realized that USNet had neither the mandate nor the financial resources to directly form a substantial number of business networks (although, in a small number of pilot cases, individual networks were assisted). The time horizon of the project (3 years) was also too short to expect significant and robust business network results from the efforts of the state partners. Yet, the "bottom-line" question remained: What were the business consequences of efforts to promote inter-firm collaboration? State partners could be motivated to sponsor initiatives to further inter-firm collaboration, but were such initiatives worthwhile from a business perspective?

We were able to identify numerous qualitative case studies of inter-firm collaboration, with most suggesting that these efforts were worthwhile. (These case studies formed the basis for the meta-case analysis reported in section 6.) However, in the existing literature,

²² USNet offered an Advanced Capacity Building workshop to representatives from five USNet member states in Amherst, Massachusetts, in 1995. This aimed to provide higher level training. The feedback from this workshop was mixed, in part because attendees had varied experiences, expectations, and state contexts, and it proved difficult to address these different needs.

there were few quantitative, survey-based studies available. Thus, we initiated our own study, focusing on existing inter-firm networks in USNet member states.

Other factors also influenced our decision to initiate a quantitative study. First, NIST and other evaluators had developed survey-based quantitative studies of the business impacts from individual MEP projects. NIST staff and other stakeholders, including state partners, desired similarly robust quantitative studies of the business impacts of inter-firm collaboration. Second, we anticipated that a consistent quantitative study across a range of business networks could provide feedback to USNet's efforts to improve its services and provide a model that could be built upon in subsequent evaluation studies. Finally, several principals in the USNet evaluation team had conducted an earlier quantitative study of the performance and impacts of two networks in Ohio. The experience from this study gave the evaluation team confidence that quantification of the impacts of inter-firm collaboration could be undertaken and would be useful, despite concerns by some networking advocates that important "soft" impacts could not be captured.²³

5.1 Study Methodology

In developing the sample, survey approach, and questionnaires for this particular study, we consulted with representatives from USNet partner states and conducted a pilot survey with network leaders and companies. We focused the study on already existing networks in USNet member states. We examined existing networks, generally those that had been active for two years or more, so that the benefits and costs could be realistically assessed by participating firms. USNet states formed the basis of the study because we needed contacts and assistance in identifying and approaching networks, to secure approval from participating businesses to participate in the study. The networks in the USNet member states had not necessarily been assisted directly by USNet. Indeed, most had not – but this was not an issue, as the objective of the study was to assess the impact of inter-firm networking on participating firms (rather than the impact of USNet per se).

Thirteen business networks in five different states agreed to participate in the study.²⁴ Two surveys were administered in early 1997: one survey of the leaders of the 13 networks and another survey of 99 members of these networks. The 99 network members responding to the survey represent a 25 percent response rate from the 395 firms to which surveys were mailed.²⁵ The evaluation team involved researchers from Georgia Institute of Technology and Nexus Associates, Inc., an independent consulting firm. In addition, RTS staff aided the survey administration process. Major findings are discussed below.²⁶

²³ Soft business impacts from collaboration include effects on trust, relationships, and knowledge flows. In fact, we shared many, although not all of these concerns, about how these could be measured – but we also believed that there was scope for improved quantification of at least some of these soft impacts.

²⁴ Doug Welch, Eric Oldsman, Philip Shapira, Jan Youtie, and Julie Lee, *Net Benefits: An Assessment of Manufacturing Business Networks and Their Impacts on Member Companies*, USNet Evaluation Working Paper 9701, October 1997.

²⁵ This response rate is comparable to that obtained in other recent research surveys of businesses.

²⁶ This discussion draws on Doug Welch, "Summing-up: The Impacts of Networks on Member Companies," *Firm Connections*, vol. 5., no. 6, November-December 1997.

5.2 *Characteristics of the Responding Network Businesses*

With a few exceptions, the network members responding to the survey were small manufacturers. Half had 40 or fewer employees and sales of under \$4 million in 1996. However, most of the companies were not micro-enterprises. While most of their operations were limited to a single state, only a handful operated from the homes of entrepreneurs. In addition, the firms reported a fair number of contacts with other organizations aside from the network, suggesting they were not isolated from the outside world. The great majority of responding network members were manufacturers, but, given the diversity of networks in which they were involved, these firms reflect a variety of industries. In addition, while the majority of survey respondents were small firms, a few were much larger than the others. Seven of the firms had over 500 employees.

5.3 *Networks and Their Activities*

Most of the thirteen surveyed networks were young, urban organizations with limited staff resources. The typical (median) network had its first official meeting between 1994 to 1996. It was initially organized by an external public or non-profit organization and currently has no legal status. The typical network had a total annual budget of about \$100,000, including a small proportion of member fees. Most also received non-financial support from an outside agency. Two-thirds of the networks supported a very small staff and all had a network coordinator.

The networks' most common primary objective was information sharing. Most (nine) of the network leaders reported that "information sharing" was a primary network objective. The networks also had other primary objectives that were more diversified, such as quality, productivity, or supply chain development or direct cost reduction.

Rating their level of satisfaction (or dissatisfaction) on a five-point scale, 31 percent of network company respondents were very satisfied with "the network's organization and activities" and an additional 52 percent are satisfied. There was slightly less enthusiasm concerning the participation of other member firms, hinting at the fundamental importance of contributions by all member companies to a network's success.

The study found that networks provide valuable opportunities for firms to interact with other firms that would not occur without the network. Network members were asked to indicate whether they engaged in a variety of activities before joining the network, and whether they currently engage in such activities through the network. It is important to identify activities firms currently engage in as a part of participating in their networks. However, to identify the impacts of networks themselves, it is more valuable to isolate network-related activities that firms currently undertake but which they did not do prior to joining the network. These results are summarized in table 3.

While varied activities were described in the survey, the most common responses concerned increased interaction and information sharing with other companies. More than half of the companies held informal discussions with other companies through the network but did not do so before joining the network. Similarly, 36 percent attended seminars, and 35 percent made visits to other plants but did not do so before joining the network. In short, networks provided valuable opportunities for firms to interact with other firms that did not occur prior to their involvement with the network.

We also observed that some companies moved beyond information sharing, developing more involved links with other firms. Network leaders reported that the relationships of

their members often followed a path of increasing intensity. This path might start with introductions, moving progressively to mutual trust, information sharing (such as advice and leads), or even legal business alliances.

As shown on table 3, some companies report cooperative activities such as work to develop standards for suppliers, joint marketing, and sharing sales leads. A few companies cite even more intensive business relationships through the network, such as group purchasing of materials, joint bidding, and collaborative R&D. These sorts of activities may have greater potential rewards than information sharing, but may also have higher risks that may explain why they occur less frequently.

5.4 Business Impacts

Most member companies reported positive effects on the firm to date and expected even larger effects in the future (see figure 1). When asked to summarize the network's impacts to date, 28 percent of respondents indicated that the network has already had a "strong positive effect" on the company. An additional 58 percent have experienced "some" positive effect. Looking ahead, firms were even more optimistic with 46 percent expecting strong positive impacts in the next two years.

To further analyze the generally positive effects reported by networked firms, we asked managers about the specific business impacts that had occurred or were expected to occur due to their network involvement. The most common impacts on the firm concern improving product quality and supply chain enhancement. As a result of network activities, 38 percent of responding companies said they improved the quality of their own products. In addition, many noted changes in their customer and supplier bases. Thirty-eight percent of companies found new customers outside of the network; 36 percent found new suppliers inside the network and 32 percent found suppliers outside the network. Development of new products, companies, and export sales were the impacts least frequently cited (table 4).

Companies also experienced positive business attitude changes through participating in networks. Qualitative research leading up to the USNet survey suggested that a company's degree of involvement in a network depended on a certain level of comfort on the part of a company in working with and trusting other member companies. That is, companies needed to develop a degree of comfort and camaraderie with their peers before they were willing to share mutually valuable information, resources, or risks.

In an effort to define and measure possible attitudinal precursors to working with others, four measures were developed and assessed as part of the company survey.

- Flexibility – confidence in your own company's ability to deal with changing market needs.
- Trust – belief in the integrity of other firms and your ability to rely on them.
- Partnership – willingness to work with other firms on projects or activities of mutual interest.
- Community – willingness to work with other local organizations.

Companies were asked whether they had experienced a change in any of these attitudes. Depending on the measure, between one-half to nearly two-thirds of respondents reported at least some improvement due to network participation (figure 2).

All network members were asked to estimate the total benefits and costs they had experienced as a result of participating in the networks to date. In addition, benefits were

broken out in terms of “sales benefits” versus cost savings; costs were broken out in terms of personnel (time) costs versus technology, training and R&D costs. It is to be noted that it is often difficult for managers to place a specific dollar value on the benefits and costs of network participation. Indeed, not all companies reported this information to us. Nonetheless, for those companies that did report, survey respondents indicated an impressive \$5.5 million in benefits to date from their work with thirteen business networks. Subtracting total costs from total benefits resulted in the net benefits to the firm of participating. The typical net benefit of network participation to the firm was \$10,000 to date; the average net benefit was \$224,000, indicating that the lion’s share of net benefits was accrued by relatively few companies (see Table 5.)

5.5 Employment and Skill Impacts

On average, companies experienced a net increase in their employment levels as a result of network participation. On average, the firms reported a net increase of 4.7 jobs as a result of the network. Importantly, however, the majority of respondents did not report any net change in employment levels. The bulk of net employment changes have occurred at a small handful of plants. Looking to the future, the majority of respondents still did not anticipate a net increase or decrease in their employment level, but the group as a whole anticipates creating an average of 6.3 jobs.

Companies were asked to report on impacts on their employees and management staff. They reported improved skills resulting for both groups, particularly managers. Fifty-one and 38 percent of respondents said that network participation has enhanced the skills of their managers and employees, respectively.

5.6 Nature of Network Participation and Business Impacts

As we have seen, companies described participating in a variety of activities through their networks (see table 3). These activities could be described along a spectrum from ‘soft’ to ‘hard,’ where soft activities required less commitment and involved little risk and vice versa. Many commonly cited network activities were softer, such as informal discussions and seminars. In general, many network leaders believed that it would take positive experiences in these softer activities before a firm would be willing to enter harder, riskier inter-firm relationships. On the other hand, the latter relationships have more potential to generate large impacts on member firms.

The survey confirmed that the risks associated with harder networking activities do pay off. On average, some harder relationships do correspond to greater impacts. Companies that reported (1) visiting other companies, (2) sharing special technical capacities with other firms, or (3) working with other firms to develop common procedures for suppliers through the network were about three times more likely to have reported “strong positive impacts” than firms that have not engaged in these activities. Similarly, companies that shared leads for potential sales leads with other member firms reported higher net benefits of network participation. The average company that reported sharing leads also reported significantly larger financial benefits from network participation – about \$570,000, as compared to about \$120,000 for firms that did not share leads.

We also observed that network activities, relationships and impacts were also influenced by time and firm size. Companies that had been in networks longer were more likely to report sharing technical capabilities with other network members. Reflecting the notion that relationships develop progressively over time, companies that “share special technical

capabilities with other companies” tended to have been involved in networks about four years longer than companies who did not share technical capabilities.

Firm size was also an important variable. On average, companies that “cooperate with others companies to develop common procedures for suppliers” or “cooperate with other companies to meet the procurement, design or quality requirements of larger companies” employed about 800 people on average. This is significantly more than the 100 or so workers employed on average by firms that did not participate in such activities.

Thus, a number of items concerning network members, activities and impacts were significantly linked. These relationships, summarized in the figure 3, may be significant not only for the 13 networks involved in this study but other networks as well.

5.7 *Conclusions from the Network Impact Study*

The study found a variety of positive effects on a group of small manufacturers that have joined collaborative business networks. Most of these firms have joined the network in the past few years and expect the impacts to continue and increase over the next couple of years. To date, the average total net benefits per firm from network participation were positive. Most firms obtained modest net benefits, although a few had much greater returns. Additionally, almost one-fifth of firms reported a net job increase – although the majority of firms either did not experience or could not estimate a net change in their employment levels as a result of network participation. Network participation improved skills of both employees and management. Respondents also cited increases in business attitudes such as flexibility, trust, and partnership. A few more ‘intensive’ network activities were associated with stronger overall impacts.

The results from the network assessment were reported back to USNet, at a Partners Learning Network Meeting in 1997, through the dissemination of the final report, and via Firm Connections.

6. Learning about the Promotion of Networks

The promotion of inter-firm collaboration has become a major tool of business and technology assistance providers in both the public and private sectors. A diverse range of inter-firm networks has emerged in the United States and other industrial countries in recent years. Over time, sponsors and other organizations have sponsored numerous case studies of these networks. In addition to the quantitative survey of the impacts of network participation, the USNet evaluation element initiated – as part of its mission to promote learning within the project – a review of available qualitative case studies on inter-firm collaboration.²⁷

The aim of the USNet case study review was to see what could be learned from the existing case literature to aid the formation and ongoing development of new networks. We anticipated that the case study review would be an effective approach to assimilating and understanding the experience of others who have formed networks. It also had the

²⁷Gordon Kingsley, *Case Studies of Inter-firm Collaboration: A Survey*, USNet Evaluation Working Paper 9605, December 1996. Gordon Kingsley and Hans Klein, *Lessons Learned from Inter-firm Collaborations: A Survey of Case Studies*, USNet Evaluation Working Paper 9703, October 1997. The discussion in this section draws on these two reports and on Gordon Kingsley, “Lessons Learned from Inter-firm Collaboration: A Survey of Case Studies,” *Firm Connections*, vol. 5., no. 6, November-December 1997.

advantage of low-cost, since we would analyze existing work (rather than commission new case studies).

6.1 Study Methodology

Typically, individual case studies have a short life as a management tool, after which they receive little further attention. However, when large numbers of cases are analyzed collectively using a consistent and focused case review method, these studies can provide many valuable insights. The USNet case review method mixed two methods: survey and case study. Instead of conducting a survey directly in the field, investigators applied a survey questionnaire to a collection of case studies.

The procedures used included the following. First, we selected a group of existing case studies of inter-firm collaboration. Second, we designed a survey through which qualitative case descriptions were converted into quantified variables. Third, several reviewers read and coded each case to see if a similar interpretation of the study could be established. Finally, the case review data was statistically analyzed.

After an extensive search, some 123 case studies of inter-firm collaboration were identified. These case studies were written by authors with four types of institutional affiliations: university researchers, consultants, state agencies, and USNet/RTS. Cases written by authors associated with USNet/RTS cases were separated from other types of consulting organizations because they accounted for a large block of the cases. (These cases typically provided the richest details about networks.) We selected only those case studies in which the inter-firm network was designed for some commercial or competitive purpose to benefit the participating firms. Case selection was not limited to networks formed at the impetus of, or in association with, a public program. We required that there be sufficient detail with regards to the origins, activities, structure, and impacts of the network. These were among the topics that were converted into variables through the survey.

Each case was surveyed to examine the presence and direction of four groups of factors. The first group comprised origin factors – including the problems stimulating the formation of the network, the industrial, market, or geographical characteristics of members, the nature of network initiator, prior collaboration, and seed funding. The second group comprised activity factors – a series of possible activities undertaken by the network. The third group comprised structural factors – including variables on the mix of network participants, number of participants, enterprise size, ongoing funding, network structure, legal organization, and staff. The fourth group comprised impact variables. Here the case survey identified different types of impacts from inter-firm networks. These were business expansion, bottom line savings, an increase in the number of projects performed by the network (project increase), membership increase, and an increase in other benefits from collaboration (benefits increase). We found that the different reviewers were in agreement 89 percent of the time in their interpretation of the cases. Disagreements in coding were resolved through rounds of discussion by the reviewers.

A calculation was also made of the difference between when the network was initiated and when the case study was written. It was assumed that longer the passages of time, the greater the likelihood that impacts will have occurred. Distinct differences were found. State agencies were by far the quickest to begin writing about networks. The typical state case was written about 1.5 years after the network was created. The other types of authors were more likely to write their cases after a longer interval following the creation of the

network – 3, 4, and 6 years respectively for university, USNet/RTS, and consultants. While consultants had the longest time interval between initiation and case write-up, this reflected a bimodal distribution. The median difference was three years.

6.2 Findings and Lessons Learned

Although the case study review looked for five different types of impacts from inter-firm networks, in the process of conducting the study it proved possible to cluster the impacts into three distinct groups. These were (1) business expansion; (2) other benefits and membership increase; and (3) bottom line savings and project increases. The origin, activity, and structural factors associated with each of these three outcomes were analyzed. The resulting models of network impacts were suggestive of strategies for the effective operation of inter-firm collaboration networks. Not surprisingly, these strategies differed according to the impact that was pursued.

Business expansion presents distinctive managerial challenges to an inter-firm network. The factors associated with this impact differ from those found in the other impact models. In expanding a business the network must be focused on the commercial endeavor and organized as a for-profit operation. There must be a clear market opportunity that brings the partners together. Strong private-sector leadership is critical. Even better is a strong commitment from each of the participants. Preferably, committed relationships should be forged among the chief executive officers of the respective organizations. Great attention should be paid at the front end of the project to whether partners have comparable and complementary skills. Procedures for qualifying network members are helpful in the expansion of a new business and should be applied ruthlessly. Similarly, there must be a clear understanding of each organization's responsibility in the network. It helps if partners already have customers in common (Table 6).

However, there is less need to spend a great deal of time on the structure of the network. Legal standing as a for-profit enterprise seems to be more important than formalizing the network organization. It is best if the source of on-going monies is from the private sector. However, a mix of on-going funds from the public and private sectors also has a positive, if somewhat less effective, association with business expansion.

In contrast, for growth impacts such as *increasing benefits and increasing membership*, structural variables are critical (Table 7). The pursuit of these goals requires the creation of a central organization that has a dedicated staff. Networks that employ a flat organizational structure will likely fail to achieve the desired growth. Strong administrative leadership is required to coordinate the efforts of network members. Greater ambiguity can be tolerated in the creation of the network as the members negotiate the extent of activities in which they will engage. However, for the network to operate coherently, clear responsibilities and goals need to be specified early.

These impacts tend to be associated with “soft” activities of information sharing, human resource development, and responding to community needs. Requiring members to “buy-in” to the network was found to create a stronger commitment towards working with each other. Impacts are more likely to be achieved when the on-going funds for the network come from the private sector or foundations. Public funding is almost never the sole source of on-going funds. Rather they are used as leverage for private sector funds.

Bottom line savings and *project increases* were affected by a wider range of factors and appear to be a hybrid between the other two models. Origin and structural factors had the

strongest influence. Networks seeking these impacts tended to strive for sustained collaboration. To achieve this end, it was important to have positive experiences early in the life of the network. The leadership of a trained broker was found to be of particular help in networks seeking bottom line and/or project growth impacts. However, it is best that this individual be drawn from the private sector. Public sector initiation by a state agency was more often associated with cases that result in failure. Interestingly, both are associated with previous collaborations, but not in the anticipated direction. For both impacts, previous collaboration does not increase the likelihood of success. Both impacts are helped when there is a strong central organization running network activities and when the sources of on-going funding are from the private sector (see Table 8).

Bottom line savings and project increases also differ in some significant ways. Networks seeking bottom line savings are, in most cases, trying to reduce and control their costs. They are similar to business expansion networks in a preference for being organized on a for-profit basis. These impacts are more likely to be associated with seed funding that comes from the private sector or foundations. Project increases are more likely to be facilitated by the presence of a staff dedicated to network activities.

Perhaps most importantly, this study finds that the factors that produce successful networks vary with the type of impacts being sought. We find that business expansion is associated most strongly with factors related to the origins of projects. Increases in membership and other benefits are most strongly associated with structural factors. Finally, bottom line savings and increases in projects are most closely associated with both origin and structural factors. This argues for flexibility in the implementation of programs to account for these different objectives.

6.3 Conclusions from the Case Study Review

A mixed message emerges from these case studies regarding the role of the public sector in promoting inter-firm networks. On the one hand, the fact that so many networks have been formed is an indicator of success. The strategy of using small grants to link small firms together through the efforts network experts seems to produce the desired result. A few of these networks are even beginning to sustain themselves as evidenced by the growth in the number of projects they pursue collectively. Further, there is strong evidence that public sector organizations effectively disengage from the network once it is up and running.

On the surface, the findings seem to imply that public agencies should avoid initiating networks. In most cases, networks built through such efforts fail to achieve any impact. This negative association extends to cases in which public monies are the sole source for seed funding. From this perspective, the public sector is more likely to be a hindrance than a facilitator.

However, the negative relationship is merely an indication that the cases authored by state agencies as a rule do not provide detail on impacts. Recall that state agencies write case studies within a year and a half of the initiation of the network. Thus, it is not the case that state agency initiated projects are more likely to fail. They simply are less likely to be in a position to report results. To a certain extent, there is a disjunction between the rhetoric of the case and the actions of network participants. While public funds are lambasted as cumbersome and unhelpful, fully 90 of the networks used these resources as seed capital. However, the evidence from the cases indicates that public agencies should avoid being the primary initiator of the network because the likelihood of achieving a successful

impact is low. The cases suggest that successful business impacts are more likely when businesses or other private associations take the lead in organizing networks.

The study is less ambiguous in recommendations regarding management strategies for promoting inter-firm networks. Perhaps most important is the finding that the factors that produce successful networks vary with the type of impacts being sought. This argues for flexibility in the implementation of programs to account for different objectives.

7. Field Services and Special Projects

USNet has provided field services and participated in special projects (including offering challenge grants) to promote the capability to support inter-firm collaboration in member states. These services and projects were agreed in consultation with partner state organizations and drew on resources from each state's USNet account, with additional matching resources in most cases. Three major categories of activities were undertaken.

- *Capacity building within the economic development and industrial extension communities.* USNet conducted strategic planning support to enhance policies and programs for inter-firm collaboration with a number of state partners, including Connecticut, Delaware, Florida, Illinois, Louisiana, Massachusetts, Minnesota, New York, North Carolina, and West Virginia. USNet also undertook industry cluster analysis studies in three states, and undertook detailed case studies of particular networks. Presentations were made to business groups, economic development professionals, and public officials in ten states. In addition, USNet organized and sponsored meetings for trade associations, manufacturers, state officials, and industrial extension personnel to meet with European counterparts.²⁸
- *Network Technical Assistance.* USNet provided technical assistance and, in some cases, funding support for the development of inter-firm networks in partner states. RTS staff and consultants were involved in these projects. Activities included assistance to food processing, machining, marine, and software networks in Massachusetts, a sewn products network in Minnesota, a designer network in Manhattan, New York, product development networks in Oklahoma and Connecticut, and a hosiery network in North Carolina. Technical support was also provided to an aerospace alliance in the state of Washington and to two networks in Louisiana. USNet further participated in the development of a manufacturers and innovation network in Delaware and a feasibility analysis of OEM supplier networks in south Florida.
- *USNet Challenge Grants.* USNet further provided matching cash challenge grants for the development of specific networks and network projects. USNet challenge grants were initiated to support the development of three networks in Oklahoma, a product development and supplier alliance in Florida, five networks or projects in Illinois, and a product development network in Louisiana.

Most USNet field service and special projects were small (involving between \$5,000 to \$10,000 of USNet funds). It was not realistic or cost-effective to design dedicated procedures to individually evaluate all of these diverse activities. However, we did implement two methods to assess what was accomplished through these field service and

²⁸ For meetings in Europe, travel costs were supported in full or part by other organizations.

special projects. First, we organized an overall benchmark survey of partner states to gather overall feedback about the quality and impact of USNet services and projects. Results from this benchmark study are reported in section 8. Second, we conducted an assessment to examine the experience of five states that were engaged in special projects with USNet. The methodology and findings from these case studies are reported below.

7.1 Methodology for Assessment of USNet Special Projects

The assessment of USNet Special Projects was undertaken to gain detail information and insights about the services provided by USNet and their impacts on network formation, organizational change within the sponsors' organization, and policy. The study also reviewed lessons learned.²⁹ Five states where USNet implemented special services or projects were examined in the study: New York, Illinois, Oklahoma, Florida, and Louisiana. For each state case, we examined the history, context, and client, as well as tracking the services provided by USNet. The case studies were based primarily on telephone interviews conducted with key participants in fall 1997 (see appendix of full report for list of individuals interviewed). The interviews were supplemented by a review of written project-related materials and progress reports. Combined together, these data sources allowed judgements to be made about outcomes and lessons learned.

In addition to special projects, USNet also provided other services and assistance to the case study states, including Foundation Forum training events and other briefings, strategic planning assistance, and resource materials. As appropriate, these other services are documented as part of the state case studies to understand the linkages and full impacts of USNet interactions in particular states.

7.2 The Five State Cases

The following section outlines the five state cases probed as part of the assessment of USNet special projects. (See the study report for full details of these cases.)

7.2.1. New York

Following a Foundation Forum in New York state in 1994, USNet held a series of customized technical assistance meetings on promoting inter-firm networking with staff of the New York Industrial Technology Assistance Corporation (ITAC). ITAC is a non-profit organization associated with the MEP that provides industrial services primarily in the New York City metropolitan region.

The USNet special project involved a series of five meetings to discuss the concept, processes, and activities that are important to successful networking among firms. These meetings took place in a nine-month period with the last meeting held in October 1997. The cost of USNet's service to ITAC was close to about \$5,000, which included travel expenses of the USNet staff and consultant fees. The USNet staff person's time of 30 hours spent on the project was charged separately to New York's USNet state allocation.

In the training meetings, USNet consultants discussed different approaches to inter-firm collaboration. This knowledge promoted ITAC staff to review the strategies they were using in promoting inter-firm collaboration. The involvement of USNet came as ITAC was identifying additional services it could provide to assist companies become more

²⁹ Mary Anne Alabanza Akers, Jan Youtie, and Philip Shapira, *Building Capacity and Support for Inter-firm Collaboration: An Assessment of USNet Special Projects in Five States*, USNet Evaluation Working Paper 9802, April 1998. The discussion in section 7 draws on this study.

competitive. Although ITAC staff had some prior awareness of networking, the series of meetings with the consultants gave them a better understanding of what it takes to facilitate networks. Interviewed staff said that the USNet involvement helped to improve awareness of the process of inter-firm collaboration and its applications to their work with small and medium-sized firms in New York. Specific follow-on projects were still at the discussion stage at the time of the assessment.

7.2.2. Illinois

In Illinois, USNet supported a matching challenge grant to stimulate new networking projects by firms in the state. The project was developed in conjunction with the Center for Governmental Studies (CGS) at Northern Illinois University and the Illinois Department of Commerce. CGS is a public service, applied research, and public policy development organization. The USNet challenge grant project followed four Foundation Forum workshops in Illinois during 1996 and 1997. These workshops targeted field agents of the Illinois MEP program, chief executive officers of firms, and other economic developers. The USNet challenge grant aimed to build on the awareness created by the Forums to promote specific network projects.

The challenge grant proposal intended that USNet and state funds be used to sponsor support a minimum of seven inter-firm projects in cooperation with manufacturing associations in Illinois. Grants were to range from \$5,000 to \$10,000, with applicants required to obtain matching funds in cash or in-kind. Five projects were actually funded, with a total commitment of \$25,000 in USNet funds. We examined one of these projects in detail – the Chicago Biotech Network (CBN). This network involved four young, small emerging biotech firms housed in a business incubator at the University of Illinois Medical Center. The network was organized by a private consultant-broker who had applied for a \$7,500 USNet challenge grant, on CBN's behalf. CBN conducted workshops on partnering with other biotech companies in the Chicago metro region, and roundtable discussions and one-on-one meetings with potential partners. The grant also supported marketing assistance in upgrading their corporate portfolios and web sites.

The USNet challenge grants helped to build on the Foundation Forums by sponsoring specific network activities. This experience suggests that it is important that educational workshops be followed by additional services (i.e., technical assistance, funding). The CBN case further demonstrated the role of an active broker and facilitator in soliciting participation from firms. Participants interviewed in the study said that the challenge grant project had stimulated the individual CBN firms to strengthen ties and collaboratively explore new market opportunities.

7.2.3. Oklahoma

In Oklahoma, USNet supported matching challenge grants for three inter-firm projects. USNet's partner was the Oklahoma Alliance for Manufacturing Excellence (The Alliance), a statewide industrial services provider and MEP affiliate. The Alliance had a prior history of work in inter-firm collaboration, beginning in 1991. A USNet Foundation Forum was held in Oklahoma City in 1995. This was followed, later in 1995, by a request from the Alliance for technical assistance from USNet to assist in organizational development and to train extension staff in the concepts and practice of inter-firm collaboration. We examined the outcomes of this training, looking at the example of the Grand Lake Manufacturers' Council – a local partnership of the Alliance in rural northeast Oklahoma. The Council (whose members include small manufacturers) sponsors a

broker/agent who works with individual companies and who engages firms in collaborative activities.

To augment individual staff technical assistance, about \$12,500 was also committed through three USNet challenge grant projects for networks dealing with product development, ISO 9000, and a virtual factory. We investigated one of these challenge grant projects – a grant of \$3,080 awarded in 1997 to Virtual Enterprise, Inc., a network of about 45 firms associated with the defense industry. The network's lead firm was Small Business Innovation Research Engineering (SBIR Engineering), a 15 employee company with close ties to Oklahoma State University. SBIR Engineering contributed matching funds and laboratory space and coordinated the participation of other companies. The USNet challenge grant aided the development of an inspection and calibration tracking system for hand tools used in defense production. Inter-firm collaboration was desirable, as individual small firms did not have the resources to develop their own inspection capabilities. By September 1997, the tracking system was operational, and 11 firms in the network had used the system. The momentum created through this project was reported to have aided further collaboration on an aircraft procurement contract. Again, direct funding from USNet promoted the development of a network. SBIR Engineering not only used these funds to implement a collaborative project but also tapped into other knowledge and resources offered by USNet program.

7.2.4. Florida

In Florida, USNet helped to finance the strategic planning and testing of a new supply-based management initiative led by the Southern Technology Applications Center (STAC) – a NASA-affiliated regional technology transfer organization at the University of Florida. The project aimed to demonstrate the concept of supplier alliances by showing how supplier and service provider collaboration in design and manufacturing could lower total product costs and reduce product development time.

USNet provided a challenge grant of \$21,000 to a supply-based management project involving an anchor firm that sought to develop and make a new laser range-finder for the commercial and defense markets. STAC and the MEP-affiliated Central Florida Manufacturing Technology Center (CMTC) provided matching support. The project sponsored market research and a product development plan. With assistance from a Massachusetts consultant, SBM² Inc., a qualification, certification, and training system for potential supplier firms was established. A process to allocate work between the anchor firm and suppliers was developed. By September 1997, eight companies were involved in the supplier alliance. STAC estimates that the product will go to market six to 12 months faster with production costs 30 to 50 percent less than originally expected. Building on this experience, STAC now aims to develop further supplier alliance networks.

7.2.5. Louisiana

In Louisiana, USNet provided technical assistance to support state policy development for inter-firm collaboration, conducted a cluster analysis, and supported a challenge grant to a product development network. USNet's principal state partners were the Louisiana Department of Economic Development (DED) and the Louisiana Partnership for Technology and Innovation (Louisiana Partnership). Prior to USNet, Louisiana had no formal policy supporting inter-firm collaboration initiatives.

A USNet Foundation Forum was held in Louisiana in 1995. This was followed by the cluster analysis project. The analysis explored the potential of industry cluster-based approaches in the state, by defining, profiling, and analyzing sectors and regional (sub-state) economies. Eleven industry segments were examined, and recommendations made on strategies and priorities for state policies based on these industry clusters. The study was completed early in 1996. However, a subsequent gubernatorial election diminished implementation possibilities, leading USNet and DED to refocus assistance toward local-level economic development organizations. In 1997, the Louisiana Partnership assumed the leadership role in supporting inter-firm collaboration in the state, and USNet worked with the Partnership to establish a challenge grant program. A \$4,000 award was made to the EV-Mar product development network, in addition to USNet funds allocated to the cluster analysis and to the Louisiana Partnership. In addition, refocusing of state strategy and USNet support to the local-level resulted in new projects to create networks of metal fabricators in north Louisiana and shipbuilders in south Louisiana. These efforts led to new state funding proposals to solve workforce shortages in these companies and to identify groups of firms in north and central Louisiana to supply components or products to the shipbuilders.

USNet's experience confirms that considerable time and commitment is needed to introduce inter-firm collaboration to a state with little pre-existing infrastructure for such efforts. USNet's Foundation Forum, cluster study, and strategic planning assistance raised awareness. Subsequently, USNet's ability to award small grants stimulated concrete actions to form networks and leverage other funds and resources. USNet's activities have spawned some new network promotion initiatives, although it is perhaps still too early to judge how durable and effective these networks will be, and whether other networks will be encouraged to form in Louisiana.

7.3 *Lessons Learned from the State Case Studies*

The five case studies examined the types of special services and projects USNet provided to its partner states (see Table 9.) All five states were involved in either one-on-one consulting, strategic planning and educational activities through the Foundation Forum and other briefings.³⁰ USNet's experience in implementing follow-on special projects illustrate the importance of working with local sponsors who understand inter-firm collaboration and are willing to apply further resources to pursue the concept. In two cases, USNet provided applied research, with mixed results (one positive, the other neutral) influenced by the local conditions for implementing research recommendations.

USNet's challenge grants had the most direct impacts on network formation and development. These modest awards, supplemented by state and local matches, built on the awareness created by educational events and stimulated organizations, brokers, and firms to develop specific network projects. Many of the contact people interviewed mentioned that the outcomes of the challenge grants demonstrated the viability and value of inter-firm collaboration. These examples helped to promote the concept of inter-firm collaboration in their respective states. The challenge grant networks also showed the importance of supporting committed lead firms and brokers, who are then able to garner further inter-firm support.

³⁰ Although not noted in the case summaries, individuals and organizations were also been aided by USNet publications. Especially mentioned during the interviews were USNet's *Network Toolkit* and the newsletter *Firm Connections*.

USNet's special projects also generated other leveraging effects, through encouraging state and local organizations to review their work programs to emphasize inter-firm collaboration. Tangible and intangible benefits were also promised, if not actually realized, by the enterprises that participated in the networks stimulated by USNet's activities. Although it is difficult to predict what would have happened in the absence of the network projects stimulated by USNet, at the very least these projects appeared to accelerate the learning, product development, and change processes essential to business competitiveness. Yet, while USNet did influence the development local networks, by itself USNet had too few resources to stimulate any fundamental redirection of state policies towards inter-firm collaboration. Where states were unwilling to make strategic commitments to inter-firm collaboration, USNet usually found it more productive to de-emphasize strategic policy and to focus on local projects.

Overall, USNet's special service projects demonstrated the value of adopting specific follow-on projects to build on the broad awareness of inter-firm collaboration created through general workshops and education. Also demonstrated was the utility of external sponsorship (through consortia like USNet) in providing the additional specialized resources and expertise that states and local manufacturing assistance agencies need to motivate local inter-firm collaboration networks.

8. State Impacts

A final element in the USNet evaluation was an end-of-program survey-based assessment that sought data and perceptions from state partners about the quality and impact of USNet services. In this section, the methodology and results from this assessment are summarized and discussed.³¹

8.1 State Assessment – Methodology

The USNet 1997 State Assessment requested information about networking activities in partner states, changes since 1994, attitudes towards inter-firm collaboration, and feedback on the USNet program. A questionnaire was developed that probed more than 30 questions on these topics. The assessment was completed in early 1998. The 1997 survey paralleled a questionnaire that was implemented in 1994, at the beginning of the USNet project.³²

Contacts were made with USNet representatives from twelve states who were members of USNet in 1997 or who had been past members. Telephone follow-ups were made with these representatives. Eight respondents completed the questionnaire sent or faxed to them. The states that responded were Connecticut, Illinois, Massachusetts, Minnesota, Washington, Oklahoma, Louisiana, and New York.

8.2 Survey Findings – Extent and Context for Inter-firm Collaboration

³¹ Mary Ann Alabanza Akers and Philip Shapira, *Networking Initiatives in the States: USNet's Involvement in Promoting Inter-firm Collaboration*. Report of 1997 USNet State Benchmark Assessment, USNet Evaluation Working Paper 9803, June 1998.

³² Philip Shapira and Jan Youtie, *USNet Baseline Assessment - USNet Member States, 1994*, USNet Evaluation Working Paper 9402. Initially, we planned to use the 1994 and 1997 surveys to track each state's progress over the life of the USNet project. However, it proved difficult to obtain a valid number of consistent same-state responses due to changes in the state membership of USNet, personnel changes among USNet state representatives, variations in survey response, and modifications in the program's activities. Nonetheless, the 1997 survey did ask questions about the position in 1994, thus allowing some retrospective comparisons to be made.

The 1997 state survey indicated that there had been significant growth in network formation and in the number of firms involved in networks compared with the situation three years earlier. In 1994, there were some 42 networks reported in the eight responding states. By 1997, the number rose to 119, an increase of 77 networks. Significant increases occurred in Massachusetts, Illinois, New York, Oklahoma, and Washington. Furthermore, a total of more than 2,446 firms were added to the number of firms connected with networks. The greatest increases were evident in Massachusetts, Illinois, New York, and Oklahoma. State respondents were asked to determine the size of firms that were members of networks. The majority of network firms were either small- or medium-sized, most with fewer than 100 employees.

Sixty-nine of the networks organized in the last three years were aided by grants or other financial incentives, the state respondents reported. Colleges, public agencies, or non-profit groups helped to launch thirty-nine networks, while some thirty-eight networks were initiated by brokers or other network champions. The number of brokers reported in the eight states had increased by 108 individuals between 1994 and 1997.

It should be emphasized that this reported growth in inter-firm collaboration among the eight responding states is not necessarily attributable to the activities of USNet. Indeed, given USNet's modest resources, the a priori expectation is that USNet's contribution is likely to have been small (although see the section 8-3 for state perspectives on the performance of USNet). However, there does appear to have been a favorable shift towards the concept of inter-firm collaboration in these states between 1994 and 1997. State respondents judged that the attitudes of firms towards inter-firm collaboration increased positively between 1994 and 1997.

The organizational climate for inter-firm collaboration has also improved positively. Respondents were asked to describe the attitudes of a series of organizations that are influential in creating the context for inter-firm collaboration.³³ In general, attitudes were reported to be more favorable in 1997 than in 1994 (table 10), with local economic development groups perceived as making the greatest change. Nevertheless, there were significant variations in current attitudes. Manufacturing extension partnership programs, state and local economic development organizations, and statewide business associations had the most positive attitudes towards inter-firm collaboration in 1997. Weaker attitudes were reported among educational institutions, governor's offices, and professional societies.

However, the generally favorable shifts in attitude toward inter-firm collaboration did not necessarily mean that all states had well-developed policy and program infrastructures to sustain specific network projects. Of the eight states, Connecticut, Massachusetts, New York, and Washington were the only ones that had legislation or formal policies to promote inter-firm collaboration. Incentive grants were more widespread, with availability reported in Connecticut, Illinois, Louisiana, Massachusetts, Minnesota, and Washington. Broker training programs were supported by state governments in Illinois, Massachusetts, Minnesota, and Oklahoma.

³³ The scale used to measure organizational attitudes towards inter-firm collaboration was as follows: 1 = no or very low identifiable awareness or expressed interest; 2 = some awareness but little leadership or action on the issue; 3 = moderate level of interest, with several initiatives underway; and 4 = strong and widespread awareness: many robust initiatives established.

Moreover, the positive changes in attitude towards inter-firm collaboration reported among state organizations did not necessarily translate into increased financial support. In terms of financial support for inter-firm collaboration initiatives, the eight states received approximately \$6.3 million from all sources in 1997 – only a modest increase of about \$0.4 million since 1994. Two states received the bulk of public funding for inter-firm collaboration in 1997 – Minnesota (\$3 million) and Massachusetts (\$1.1 million).³⁴ Oklahoma received the most funding from private sources (\$0.3 million).

8.3 State Perceptions of USNet's Performance and Impact

The 1997 state survey also asked for state partner feedback on USNet's performance and impact. Respondents were asked thirteen different questions about various aspects of USNet's services and activities during the period 1994 to 1997. Overall, the state feedback was positive.

Among the activities that we probed was the USNet Partners' Learning Network. This network involved key personnel from participating states, USNet staff and consultants, NIST staff, and a series of invited network specialists, brokers, and business participants. Meeting three to four times a year, the Partners' Learning Network was designed to provide opportunities for information sharing, best practice dissemination, and partner review of the project. For the eight states, at least 32 individuals were reported to have participated in meetings of the Partners' Learning Networks. The respondents' assessments of these learning networks were good (table 11). No negative responses were received. Participants confirmed they had gained new information and increased awareness of other states' experiences and practices. New contacts were also made. However, respondents less strongly agreed that the Learning Networks had given them ideas to resolve problems or bottlenecks.

We also asked respondents for their overall views on the USNet Foundation Forum. All eight states had hosted Forums. Again, state respondents were generally satisfied with the quality and content of the Forums. Two respondents said that they were very satisfied, three were satisfied, and two were neutral. One respondent did not attend the Forum in his state. Views on subsequent Forum impacts were also positive. The state respondents said that the strongest Forum impact was on changes in attitudes towards inter-firm collaboration, with modest effects on changes in policies and programs and the creation of new networks.

We probed whether state participation in USNet provided tools, information, or other resources that helped to create, maintain, or improve the operations of inter-firm networks in respondents' states. Again, the answer was affirmative. The state respondents said that at least 71 networks were assisted in some way through state participation in USNet. This was equivalent to about 60 percent of all the networks reported by the eight states in 1997. USNet participation most aided state networks in three states - Illinois, New York, and Oklahoma. In addition, the eight states reported that their participation in the project resulted in USNet tools, information, or other resources being provided to 89 organizational "hubs" that promoted inter-firm collaboration.

We also asked a series of questions about the usefulness of the publications and toolkits developed by, or in association with, USNet. Seven of the eight respondents indicated

³⁴ The Minnesota respondent used a broad definition of inter-firm collaboration, resulting in an expanded budget estimate.

that they read the newsletter Firm Connections and found the articles relevant. Five respondents reported that they circulated the newsletter to others in the state. Most of the respondents were aware of and had used the networking tool kits developed by USNet. Six of the eight respondents circulated these kits to others in their states. Four of these respondents said the kits were used as models for networking activities in the state.

Half of the sample had made requests from the USNet's Resource Center. Of these four, two were very satisfied, one was satisfied, and the other was neutral. Two respondents did not know whether their state had made requests, while two others were sure that requests had not been made. Six of the respondents mentioned that they consulted with USNet resource specialists. Visits by these specialists were made in five states. Four states reported that these visits led to action in policy and program areas.

Overall, state respondents were satisfied with USNet. Six of them found USNet very useful to their state, while two said somewhat useful. A series of additional written and verbal comments were made by state respondents. Several respondents indicated that they would like to see a continuation of the Partners' Learning Network meetings. One state requested a better integration of the concepts of regional industrial clusters and inter-firm networking. Another respondent suggested that greater attention should be paid to the external economic benefits generated through inter-firm collaboration. Finally, suggestions were made for greater emphasis and leadership within the MEP system to promote networking and inter-firm collaboration.

9. Conclusions

The USNet project involved multiple states in a series of diverse activities to promote inter-firm collaboration. There were changes in the membership and goals of USNet during the program's operational life. There were also significant differences in the state and local contexts, which affected what the project could achieve. It was intended that USNet should serve as a demonstration effort and promote learning and best practice dissemination about inter-firm collaboration. At the same time, USNet was also expected to achieve concrete results – albeit with modest resources.

This mixture of goals, methods, and membership complicated the evaluation of the USNet, although it also resulted in a richly textured project that presented many opportunities for learning and feedback. We drew on these opportunities to undertake a series of distinct studies and assessments of USNet's performance and impacts. In addition, aware that USNet had a fixed time horizon, we also made efforts to contribute to broader debates about the effectiveness and outcomes of strategies to promote inter-firm collaboration.

Although there were variations in some results of the different USNet evaluation studies, there was a much greater degree of consensus. What are the principal findings from the evaluation effort?

1. Firms who collaborate in inter-firm networks report positive net benefits, while greatest private impacts are associated with strong industry leadership of networks

Our studies showed that firms who collaborate in inter-firm networks report positive net economic benefits, as well as valuable effects on information sharing, know-how, and business strategy. In most instances, these impacts are relatively modest; however, the net

impacts seem to be greater for those firms and networks that are engaged in more intensive collaborative activities over longer periods of time. Strong industry leadership of networks also appears to be associated with the greatest private impacts. The implication is that public efforts to promote networks should ensure that networks are industry driven.

2. USNet’s original network promotion goals were too ambitious, given the resources available

It is apparent that USNet’s original goals were too ambitious. For example, in its proposal for funding to the Technology Reinvestment Project, USNet set a performance benchmark “that the ten partner states would establish, on average, ten networks per year”. This implied a three-year goal of about 300 networks.³⁵ This has not been achieved. USNet never had the necessary resources to sustain this level of effort. Moreover, as it turned out, the partner states, although committing small amounts of matching funds to USNet, had not incorporated this strategic objective into their own individual economic development and industrial modernization strategies. Mostly, the partner states were at a much earlier stage of conceptualization, learning, and exploration about inter-firm collaboration and looked to USNet for more diffuse and customized assistance.

3. Judged against more realistic expectations, USNet has performed well

To its credit, USNet flexibly adapted itself to the realities of the state situation, and restructured its program to offer customized services to its state partners. Thus, judged against more realistic expectations of what was possible, it does seem that USNet has performed well. The state partners’ generally report favorably on USNet’s services, resources, publications, and special projects. This does not mean there were not criticisms. State partners did not always find the practical tools or models they were looking for (although, in USNet’s defense, it is not clear that such tools or models were anywhere available – but depended on local action to forge). At the same time, the commitment of some states to the project fluctuated, with changes in policies and personnel outside of the control of USNet. In several cases, USNet had to start again with a particular state organization. In other examples, plans and programs had to be modified, with the loss of prior resource investments.

³⁵ In the eight states responding to the 1997 state assessment, there was a reported increase of 77 networks over three years – an average of about 3 new networks per state per year. These networks were not necessarily aided by USNet – although the states reported that about 60 percent of the networks operational in 1997 had benefited in some way from USNet-provided tools, information, or other resources.

4. USNet's training programs have generated widespread awareness about inter-firm collaboration

One of the greatest impacts of USNet has been through the training of nearly 700 individuals across 13 states through Foundation Forums, CEO briefings, and other training events. Two-fifths of the trainees were from public agencies and economic development groups, one-fifth from manufacturing extension programs, and the balance from educational institutions, consulting firms, private business, and industry groups. Our longer-term studies showed that these sessions increased knowledge about inter-firm collaboration, disseminated best practices, and – for some participants – stimulated follow-up activities with firms.

5. USNet special projects demonstrate the value of explicit follow-on initiatives to promote inter-firm collaboration

USNet's special projects also seem to have been useful, although for several it was still too early to determine the full effects. While research and planning efforts had mixed results, greater effects were reported with the USNet challenge grant program. This challenge grant program confirmed that modest amounts of money could leverage other resources and motivate firms and brokers to form networks. Furthermore, USNet's special projects demonstrated that general education and awareness building programs need to be followed by specific network promotion activities.

6. USNet policy and organizational impacts at the state level were modest

USNet's policy and organizational impacts at the state level were generally modest. This is not surprising given the modest investment allocated to USNet. Nonetheless, there were variations in policy impact by individual states. A few states with established structures for inter-firm collaboration have effectively leveraged USNet services to strengthen their initiatives. Some states have had personal and policy changes (outside of USNet's control) that have limited their returns from USNet. In other states with less developed policies and organizations for inter-firm collaboration, USNet has sponsored several useful pilot projects, planing studies, and forums. It is again too soon to tell whether these pilots will lead to more substantive and durable state-level and industry investments.

7. Federal support can strengthen efforts to promote inter-firm collaboration at the state level and aid shared learning

The USNet project was initiated through federal action that then attracted matching state funds. Although the total amount of funds contributed is modest, the existence of an inter-state consortium strengthened efforts to promote inter-firm collaboration in participating states, particularly in terms of action if not always through substantive policy changes. The USNet consortium allowed the sharing of experience and information, the dissemination of best practice and new models, and the development of specialized resources and programs that states could draw upon. Unnecessary duplication was avoided (e.g. by each state developing its own basic training courses). Some states were more advanced than others in developing policies and structures to promote inter-firm collaboration, although all benefited at some level from the exchange opportunities and specialized resources made available by USNet. It is our judgement that without ongoing support from USNet or another national or federal organization, there is a reduced

likelihood that efforts to promote inter-firm collaboration will develop consistently and to their full potential across the states.

With the ending of the USNet project, the MEP program could and should continue to exercise leadership by giving greater emphasis to inter-firm collaboration among its network of industrial extension providers. We found that local MEP service providers are interested in efforts to promote inter-firm collaboration. There remains a valuable opportunity for a focused organization outside of the MEP or a renewed program within the MEP to promote the concept. Within the MEP, stronger encouragement for inter-firm collaboration by NIST management would assist MEP service providers in extending local network activity. Additional special project funding to support demonstration networking efforts by local MEP centers would also be worthwhile. At the very least, opportunities for inter-state exchange and sharing should be sustained, drawing on the positive experiences reported from the USNet Partners' Learning Network.

USNet has enabled the sharing of learning about what works (and what does not) in promoting inter-firm collaboration. It is apparent that network promotion is not easy. It has not always been clear how inter-firm networks can or should be built. USNet has prompted considerable discussion about experiences with different models, the role of industrial associations, links with supply chains, relationships with industrial extension, appropriate forms of policy, and the effectiveness of different methods and approaches to stimulating networks. Indeed, there has been debate about whether industrial networks should be seen as permanent or impermanent structures. Throughout, the dialogue has been driven by pragmatic experience and a concern with industry needs. Ideas and concepts about networks have changed among USNet's participants. We view this as a positive development in a still emerging field where experimentation about how best to promote collaboration needs to be fostered. Hopefully, rather than reinvent the wheel, future efforts will build on the experiential base, tools, and insights that USNet has developed.

Table 1 Attitudes Towards Inter-Firm Collaboration or Networking, Before and After the Foundation Forum

Attitude	Before the Forum	After the Forum	Change in Attitudes	
	Respondents	Respondents	Respondents	Percent
First Foundation Forum Follow-up Study (6 Forums, 47 Respondents)				
Enthusiastic	25	34	9	36%
Interesting idea	17	11	-6	-35%
Skeptical	5	2	-3	-60%
Second Foundation Forum Follow-up Study (7 Forums, 40 Respondents)				
Very positive	17	24	7	41%
Moderately positive	12	15	3	25%
Neutral	11	1	-10	-91%

Source: 1995 and 1997 follow-up surveys of USNet Foundation Forum participants (N=87).

Table 2 Impacts Prompted by Foundation Forum Participation

	Number	Percent
Activities within respondent's organization prompted by Foundation Forum participation		
• Promotion of inter-firm collaboration among firms	54	62.1%
• Identification of candidates for networking	43	49.4%
• Identification of brokers, scouts, network facilitators	24	27.6%
• Gathering data to show connections among firms	15	17.2%
• Group training programs for brokers, scouts, network facilitators	10	11.5%
• Other activities	6	6.9%
Changes requested from government agencies or elected officials to promote network activities, as a result of the Forum		
• Additional resources	29	33.3%
• Increase in service coordination among public sector agencies	28	32.2%
• Changes in agency work plans	18	20.7%
• Changes in state policy	3	3.4%
Activities with trade associations, prompted by the Forum		
• Promotion of inter-firm collaboration or networking among firms.	32	36.8%
• Identification of candidates for networking.	26	29.9%
• Group training programs for brokers, scouts, network	20	23.0%
• Gathering data to show connections among firms	17	19.5%
• Identification of brokers, scouts, network facilitators	14	16.1%
• Jointly lobbying for changes in state policy	3	3.4%
Changes requested from government agencies or elected officials to promote network activities, as a result of the Forum		
• Additional resources	29	33.3%
• Increase in service coordination among public sector agencies	28	32.2%
• Changes in agency work plans	18	20.7%
• Changes in state policy	3	3.4%
Activities with trade associations, prompted by the Forum		
• Promotion of inter-firm collaboration or networking among firms.	32	36.8%
• Identification of candidates for networking.	26	29.9%
• Group training programs for brokers, scouts, network	20	23.0%
• Gathering data to show connections among firms	17	19.5%
• Identification of brokers, scouts, network facilitators	14	16.1%
• Jointly lobbying for changes in state policy	3	3.4%
Collaborative activities with small and medium-sized enterprises prompted by the Forum		
• Identify candidates for networking	43	49.4%
• Distribute information about inter-firm collaboration to SMEs	42	48.3%
• Form networks	27	31.0%
• Start training programs for inter-firm collaboration	9	10.3%
• Other	2	2.3%

Source: 1995 and 1997 follow-up surveys of USNet Foundation Forum participants (N=87).

Table 3 Network Activities Reported by Participating Companies.

Network-related activities	All firms ^a	New activity ^b
	Percent	
Hold informal discussions with other companies	76	53
Attend seminars with invited speakers	68	36
Visit plants of other companies	64	35
Share special technical capabilities with other companies	46	28
Cooperate with other companies to develop common procedures, including standards and certification, for suppliers	34	28
Prepare joint marketing materials for products or share the cost of trade shows with other companies	31	27
Share leads for potential sales with other companies	39	26
Cooperate in training programs	37	26
Cooperate with other companies in meeting the procurement, design or quality requirements of larger customers	32	24
Purchase raw materials and services on a group basis	19	17
Bid on contracts with other companies	21	16
Cooperate with other companies in collaborative product research, product development, or product design	24	16

Source: Survey of members companies of manufacturing business networks, 1997 (N=99). In rank order of responses indicating firms currently do the activity but did not do so before joining the network. Note:

^aPercentage of *all* firms that currently undertake the activity as part of network.

^bPercentage of firms that currently undertake the activity *but never did before network*

Table 4 Business Impacts on Firms Resulted or Expected to Result from Involvement in the Network

Impact	Resulted ^a	Expected in the next 2 years ^b
	Percent	
Improved the quality of your own products	38	28
Found new customers outside the network	38	23
Found new suppliers inside the network	36	20
Found new suppliers outside the network	32	25
Increased sales in the U.S.	31	27
Increased profitability	30	36
Improved an existing manufacturing process	30	22
Improved relationships with major customers	27	19
Adopted new technologies or new manufacturing practices	25	28
Realized an improvement in supplier quality	24	26
Saved money by group purchasing, marketing or equipment sharing	24	22
Found new customers inside the network	23	25
Developed a new product or service	19	23
Increased export sales outside the U.S.	7	27
Established a new company or business venture	4	14

Source: Survey of members companies of manufacturing business networks, 1997 (N=99).

Note:

^a Percentage of all firms reporting the impact *has* resulted.

^b Percentage all firms where the impact is *expected* in the next 2 years but has *not* occurred yet

Table 5 Summary Measures of Benefits, Costs, and Net Benefits Resulting from Company Participation in Networks (Per Company)

Per Company	Last 12 months	Total since start of network membership
Mean (Average)		
Total Benefits	\$118,445 (n=47)	\$334,553 (n=45)
Total Costs	\$14,359 (n=58)	\$103,099 (n=58)
Net Benefits	\$106,220 (n=45)	\$224,085 (n=43)
Median		
Total Benefits	\$15,000 (n=47)	\$30,000 (n=45)
Total Costs	\$3,000 (n=58)	\$10,000 (n=58)
Net Benefits	\$9,300 (n=45)	\$10,000 (n=43)

Source: Survey of members companies of manufacturing business networks, 1997.

Table 6 Business Expansion Model

Factors		Significance	Direction of Influence	
	Market Opportunities	.001	+	
	Shared Customers	.001	+	
	Private Firm Initiation	.002	+	
Activity Factors	Information Sharing	.003	-	
	Marketing and Sales	.000	+	
	Hardware	.004	+	
Structural Factors	Sources of Funds	.002	+	Private Sector
	Legal Status	.001	+	For Profit

Source: Survey of inter-firm collaboration case studies, 1997 (N=123). Note: Significance of relationship is highest where significance = .000. See full report for details on coefficients.

Table 7 Increase in Membership and Other Benefits Models

Factors		Significance	Direction of Influence	
Increase in Membership Model				
Origin Factors	Local Agency Initiation	.005	+	
	State Agency Initiation	.004	-	
Activity Factors	Human Resource Activities	.001	+	
Structural Factors	Frequency	.005	+	
	On-going Funding	.000	+	
	Source of Funds	.000	+	Mixed & Foundations
	Network Staff	.000	+	
	Network Structure	.000	+	Central Organization
Other Benefits Model				
Structural Factors	Size of Participants	.002	+	Mixture of Sizes
	On-going Funding	.000	+	
	Source of Funding	.000	+	Private and Mixed
	Network Staff	.011	+	
	Network Structure	.000	+	Central Organization

Source: Survey of inter-firm collaboration case studies, 1997 (N=123). Note: Significance of relationship is highest where significance = .000. See full report for details on coefficients.

Table 8 Bottom-line Savings and Project Increase Models

Factors		Significance	Direction of Influence	
Bottom-Line Savings Model				
Origin Factors	Shared Suppliers	.002	+	
	Initiators	.000	+	Firm and Not for Profit
	Private Sector Initiation	.003	+	
	Public Sector Initiation	.001	-	
	State Agency Initiation	.002	-	
	Previous Collaboration	.000	-	
	Seed Funding Source	.001	+	Private Sector
Activity Factors	Direct Cost Reduction	.008	+	
Structural Factors	On-Going Funding	.001	-	
	Source of Funds	.000	+	Private Sector
	Network Structure	.000	+	Central Organization
	Legal Structure	.008	+	For Profit
Project Increase Model				
Origin Factors	Firm Initiated	.002	+	
	Public Sector Initiated	.007	-	
	State Agency Initiated	.000	-	
	Previous Collaboration	.001	?	
Structural Factors	On-going Funding	.000	+	
	Source of Funds	.000	+	Private, Foundation, Mixed
	Network Staff	.007	+	
	Network Structure	.000	+	Central Organization

Source: Survey of inter-firm collaboration case studies, 1997 (N=123). Note: Significance of relationship is highest where significance = .000. See full report for details on coefficients.

Table 9 Case Studies of USNet Special Services and Outcomes

Organizational and State ^a	Types of USNet service				Outcomes
	Technical assistance ^b	Applied research	Challenge grants	Education ^c	
ITAC, New York	✓			✓	Better understanding of inter-firm collaboration
CGS, Illinois	✓		✓	✓	Formation and expansion of bio-tech network; partnering meetings
The Alliance, Oklahoma	✓		✓	✓	Virtual factory network calibration tracking system; formation of manufacturing council
DED/ Louisiana Partnership, Louisiana	✓	✓	✓	✓	Promotion of inter-firm collaboration; assistance network formation – product development, fabricator & ship-building, and other networks
STAC, Florida	✓	✓	✓	✓	Formation of network for supplier and product development

Notes: ^aSee text for explanation of acronyms. ^bOne-on-one consulting, strategic planning. ^cFoundation Forums, other presentations.

Table 10 Attitudes of Organizations Towards Inter-firm Collaboration

Organizations	Attitude in 1994 (mean score)	Attitude in 1997 (mean score)
Statewide trade and business associations	1.9	2.8
Local/industry sector business association	2.0	2.6
MEP	3.0	3.3
Lead state economic development agencies	2.4	2.8
Lead economic development groups	1.9	3.0
Educational institutions	1.6	1.9
Professional societies	1.3	1.6
Governor's office	1.6	1.9

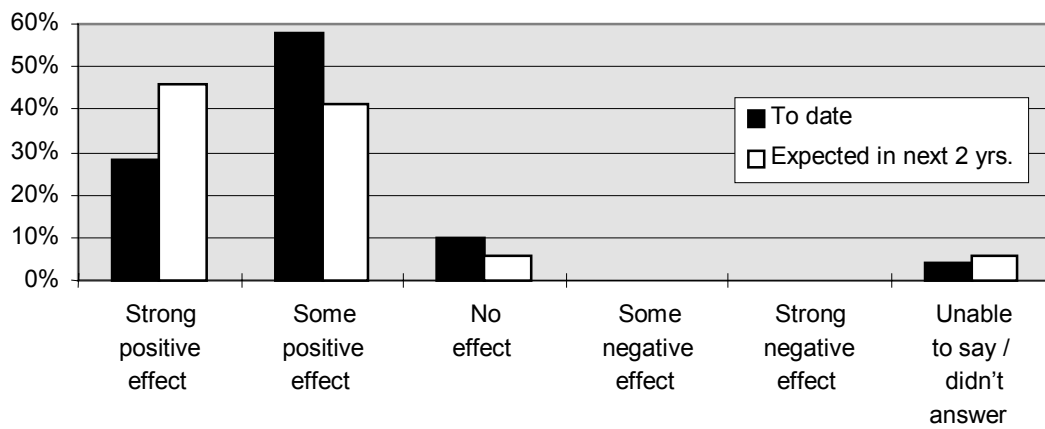
Source: USNet 1997 State Assessment (N=8). Respondent is state USNet coordinator. See text and footnote for discussion of scale.

Table 11 State Assessment of the USNet Partners Learning Networks

Statements (About the Partners' Learning Network)	Strongly agree	Agree	Neutral
Learned new information useful to promoting networking in my state	4	3	1
Made new contacts which I have subsequently called upon	3	4	1
Became aware of experiences and practices in other states	4	4	-
Able to get ideas to resolve problems or address bottlenecks	-	6	2
Became aware of tools	2	4	2

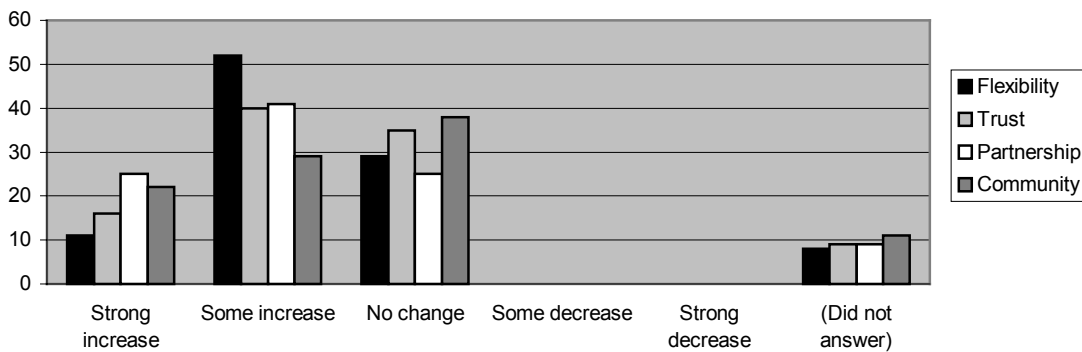
Source: USNet 1997 State Assessment (N=8). Respondent is state USNet coordinator. Note: No one disagreed with the statements.

Figure 1 Overall effects of network on business, to date and expected



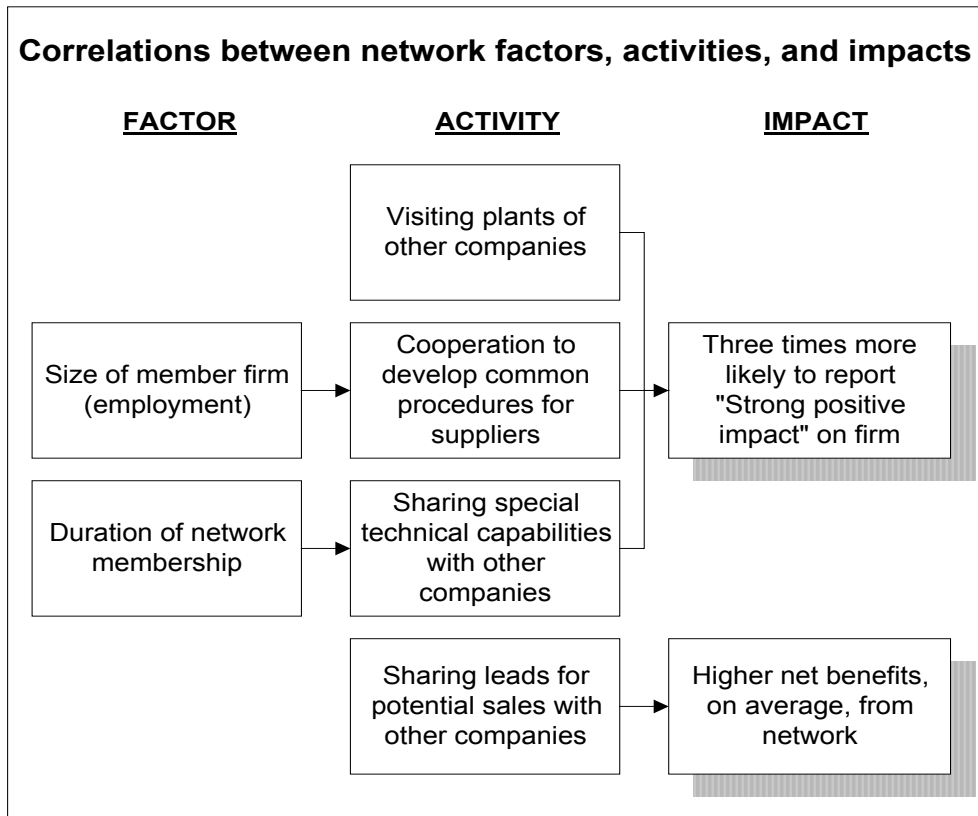
Source: Survey of members companies of manufacturing business networks, 1997 (N=99).

Figure 2 Changes in business attitudes or relationships due to network participation, percent of companies



Source: Survey of members companies of manufacturing business networks, 1997 (N=99).

Figure 3 Linkages found in USNet network member study



Source: Survey of members companies of manufacturing business networks, 1997 (N=99).

Public-Private-Partnerships: suitable instruments for the development of regional information resources?

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My topic in this book is the connection between regional knowledge transfer and a specific wide spread organizational form of this cooperation which has become well known world-wide as public-private partnership (ppp). The following table of contents (Figure 1) summarizes my arguments¹.

Figure 1: Contents

- | | |
|----|--|
| 1) | Introduction and Terminology |
| 2) | Advantages of PPPs for Regional Knowledge Transfer |
| 3) | Disadvantages of PPPs for Regional Knowledge Transfer |
| 4) | Conclusion: PPPs as Suitable Instruments for Regional Knowledge Transfer under Certain Circumstances |

My research group on "automation in public administration" at the university of Kassel is a good background for the topic ppps and knowledge transfer. The research group is working since almost 25 years about the connection between information technology, organizational processes and the political shaping of this connection.

1 Introduction and Terminology

I would like to give you some information about the effects of public-private-partnerships for regional knowledge transfer in this session. PPPs seem important for the problem of knowledge transfer to me because there is a tight organizational relationship between the two topics. The following figure 1 shows the wide international field of public-private-partnerships which deal with the development of regional information resources (Castells/Hall 1994, Montanheiro et. al. 1997, Gerstlberger 1999).

Figure 2 gives you an impression of the importance of the organizational form of ppps for regional and local knowledge transfer. Especially these projects which shall encourage traffic, telecommunication or multimedia need public *and* private support. The most important reason for this is the long-term orientation of these activities. In the first years they often cost a lot of money and manpower while their benefits can only be seen in the long run. A very common example for this effect are world exhibitions like the coming Expo 2000 in Hannover (Häußermann/Siebel 1993).

Figure 2: International examples of ppps and knowledge transfer

¹ I am indebted to Detlef Sack, Heiko Homburg and Robert Lohde-Reiff – my (former) colleagues at the university of Kassel - for their critical and helpful comments.

Media-Park Cologne
 Regenerating South Yorkshire
 One-Stop-Agencies in Sweden
 Telecommunications in North Carolina
 New Airport in Athens
 Seville's Cartuja '93
 Science Castle in Tsukuba
 Technology Park Sophia-Antipolis
 Cop van Zuid in Rotterdam
 Urban Renewal in Jaroslavl
 New Potsdamer Platz in Berlin
 Venice: Tangentopoli
 Science Town Taedok
 Science City Ulm

These events have a strategic importance for technology transfer and the economic development of a country and its regions, but can not be initiated without public deficit-spending. A similar dilemma can be shown for ambitious technology parks like the "Wissenschafts-Stadt" (scientific city) Ulm in southern Germany or Sophia-Antipolis in southern France (Castells/Hall 1994, Majer 1996; 1997). The "innovative milieu" in these parks - a mixture between theoretical research, practical research and business activities - is generally useful for the development of new products and processes. Therefore they have an important potential effect for the long-term development of regional or even national economies. But to realize this effect, short-time public investment in staff, facilities and communication is necessary. Especially the cost for the last point is often underestimated. The creation of a successful communication network between technology parks and their potential markets is dependent on a lot of financial support and manpower.

The growing importance of public-private-partnerships in many different countries in the last years provided a broad stock of experiences which could help to organize public-private collaboration in a better, more effective way for both sides. The most important empirical limitation for the necessary exchange of these experiences is a very fragmented research landscape. There is almost no available survey data, even in the USA with their quite old and strong tradition of public-private collaboration (Squires 1989). The main source of research results are (often narrow) case studies in single regions or cities. Comparisons between strategies in different countries are also hardly available.

In awareness of this background and gap in research I will try to summarize and compare experiences from public-private collaborations in Germany, the Netherlands, the United Kingdom and the USA. Thereby I will concentrate on projects which deal with regional information resources, like the development of traffic facilities or the support of local technology parks. The data base for this summary are results from documents and roundabout 40 interviews with experts like scientists, politicians, business-men and employees in different public organizations conducted in the years 1996 and 1997. For the case of Germany there is also some survey data available which was collected during the year 1996 in my research group on automation in public administration at the university of Kassel. This data refers to all German cities with more than 50.000 inhabitants (compare Gerstlberger 1998, Gerstlberger/Kneissler 1998, Gerstlberger/Grimmer/Kneissler 1998 for further details).

Before starting with the results of this research, I should like to give you some terminological definitions. Public-private-partnerships - as the independent variables - in my definition are formal collaborations between two or more public and private organizations. The partners who participate in ppps contribute different information resources. The (more) private organizations usually have more economic and technical know-how and better knowledge about the market conditions in certain areas. The (more) public partners often know better about administrative and political procedures: for example how to get additional financial support from governmental programmes for regional development or how to get the official permission for special traffic projects. These partnerships have a legal base and deal with their own money and staff. Organizations which are neither purely public or private like chambers of commerce or universities, are often involved along with private firms and public administrations. PPPs are - finally - often multi-actor-networks. We will see later that this is very important for their advantages and problems.

The terms knowledge transfer and development of regional information resources - as dependent variables - are used here very openly. They refer to hard information technology (e.g. multimedia projects) as well as to soft information which is exchanged in inter-organizational networks. Soft information is in its practical meaning for example regional knowledge about certain products or special markets. In a more abstract sense certain local or regional cultural traditions which result from a long history of public-private collaboration are also a kind of soft information (Thrift/Amin 1994, Bausinger 1996). Famous for such a strong public-private culture is for example Pittsburgh (USA). In this region new projects are developed almost automatically in public-private cooperation because of a very successful common tradition in existence for more than five decades (Stewman/Tarr 1982, Budäus/Grüning 1996).

One last opening remark: the following research results are focused on regional and local ppps. This restriction seems to make sense because most public-private collaborations take place at the regional level. In spite of this restriction one could suppose that there are similar developments at the national level given similar multi-actor-networks.

2 Advantages of Public-Private-Partnerships for Regional Knowledge Transfer

The general advantages of public-private-partnerships compared with either single public or private activities can be summarized in the term *Interdependence* (Kouwenhoven 1993: 121 f.). Interdependence means that - especially at the regional level - public and private organizations share some common interests. They all are - on the one hand - in the long run dependent on good traffic facilities, universities and other institutions of higher education or telecommunication systems. On the other hand hardly any organization can finance expensive regional facilities any more. Given this general situation in different political-administrative systems joint ventures between many public and private organizations can help to reduce the financial risk of all partners. This main advantage has a number of details which are shown in Figure 3.

Figure 3: General advantages of ppps

- Staff from the private sector
- Integration of affected citizens or customers
- Engagement of "half-public" organizations
- Access to governmental development funds
- Better market conditions for private firms

Beside the shared financial risk public-private-partnerships have some advantages which result from the coupling of different knowledge resources:

- Public-private joint ventures make it possible to recruit staff with special economical or technical know-how from the private sector. These kinds of qualifications are often missing in purely public organizations. Furthermore, special know-how can be used more flexibly in public-private projects - e.g. only for a shorter period - than it is usually possible in the public sector.
- Affected citizens or customers can be integrated more easily in public-private communication networks than in the everyday work of purely public or private organizations. The main reason for this experience is the generally more flexible work of joint ventures: they rely on a special project management and not on a routine working style. Therefore suggestions and critical remarks from outside the everyday information routines can be accepted more easily.
- For the private partners in ppps political and administrative procedures are less difficult to manage because of the special knowledge of the public side in this field. This can be seen e.g. in multimedia projects in different countries (the United Kingdom, Germany): local administrations can participate in contests of the national governments to get financial support for the development of multimedia projects and need therefore technical help from specialized private firms. This example leads to a further advantage for private organizations. PPPs often have to do with emerging markets: private firms which are early involved in this markets have a better starting position than their competitors.
- Many regional or local chambers of commerce, universities or public banks (for example the German "Sparkassen") help to finance public-private-partnerships. The main reason for this engagement is the growing dependence of "half-public" organizations on the economic development in regions and cities. Especially the participation of the public banks helps to reduce the financial risk for the private partner(s).
- One last point: The European Community (EC), many national states and some federal states (for example the German "Länder") work with development funds which support regional public-private joint ventures with high priority. This support is regularly a decisive argument for the investment of private capital. The significant contribution of public-private-partnerships for economical regional development can be shown for Germany in two figures referring to the survey data mentioned.

Table 1 Legal forms in urban planning and federal states in Germany

Federal States	Public (in %)	Public-private (in %)
Old	95	5
New	69	31

Ch² = 10,2; df = 1; C's V = 0,32; p = 0,00; n = 98

Source: Survey of Administrative Modernization in Germany in the Year 1996

Table 1 shows that in the new federal states ("Länder") in Germany significantly more public-private-partnerships in urban planning and housing can be found than in the old ones. While 31% of the questioned cities in the new Länder have public-private joint ventures in this field, in the old Länder only 5% can be mentioned. The clear difference between poorer new and richer old Länder reflects the high importance of public-private collaboration for the manner in which uneven economical regional development at the national level is dealt with politically. A similar picture can be drawn in the field of communal economic subsidies (in German: "Wirtschaftsförderung").

Table 2 Communal economic subsidies and polytechnic colleges in Germany

PC's	Public	Public-Private
Yes	54	83
No	46	17

Ch² = 6,7; df = 1; C's V = 0,27; p = 0,00; n = 95

Source: Survey of Administrative Modernization in Germany in the Year 1996

Table 2 shows the connection between federal and local aspects in public-private-partnerships. The federal polytechnic colleges (smaller institutions of higher education with a very practice oriented programme of teaching and research) often are a supporting factor in and member of local public-private collaborations. While 83% of the analyzed public-private joint ventures for economic support are settled in regions with polytechnic colleges, the corresponding number for cities without polytechnic colleges is merely 17%.

Comparable survey data for countries other than Germany are not available at the moment. But case studies about public-private urban and regional regeneration in the old-industrialized parts of the United Kingdom, the USA and France or the bigger cities in the Netherlands suggest similar findings (Kreukels/Spit 1990, Castells/Hall 1994, Naschold 1997). In all of these countries the close regional cooperation between private enterprises, universities and local public administrations is an important factor in the process of creating innovative products and new technology markets.

The general advantages of public-private-partnerships for regional economical development and knowledge transfer discussed have to be compared with some meanwhile obvious risks and problems which can also be seen in the empirical research material available.

3 Disadvantages of Public-Private-Partnerships for Regional Knowledge Transfer

The main problem in the framework of public-private collaborations is - as already implied - the organizational and financial coordination of multi-actor-networks. This summarized disadvantage can be shown in different details (figure 4).

Figure 4: General disadvantages of ppps

- difficult exchange of information
- different "professional cultures"
- Loss of influence for local politicians
- Gap of a wider political support-network
- Lack of concrete goals
- long-term dependence on governmental development funds

The following problems of coordination and related risks regularly occur in public-private-partnerships - independent from national political-administrative systems:

- An equally wide-spread as well as simple difficulty is the problem of the large number of different actors in ppps. As most of the current ppps encompass a large number of different actors, the exchange of information as well as the distribution of tasks are often faulty and time consuming. This is especially the case in ppps which have no outstanding single actor(s) (e.g. a chief executive or important politician) working as "linking pin(s)" between public and private organizations. These types of coordination problems are often made even worse by the fact that the participating actors are working together for the first time. As a rule various types of informal contact between the partners takes place before official cooperation begins yet nevertheless with the begin of formal cooperation new situations are faced.
- Differences between public and private actors in technical and financial know-how and "professional culture" often lead to expensive and time-intensive communication problems. The more actors from distinct organizations are involved, the more difficult it is to find a common language and working style. The cultural problems of public-private cooperation, as refers to the participating public organizations, are often only worsened by tight legal regulations or treaties between trade unions and employer organizations. This especially effects the limited flexibility of personnel action and budget limitations which bound short notice changes in investment planning.
- For local and regional political representatives the contracting out of projects in public-private joint ventures means a potential loss of influence. Therefore additional steering instruments are regularly installed - for example boards with political advisors or controlling systems. These additional steering instruments sometimes help to recognize certain financial risks early enough, but also need extra time and money. The amount of these additional resources grows - of course - with the number of partners.
- In contrast to their potential loss of personal influence local and regional politicians often focus too little interest on the wider political frames of public-private joint ventures. The economic success of – for example – a "scientific" or "multimedia-city" depends on the close cooperation between (European), national, federal and local governments. Furthermore some more or less independent public bodies – like banks, research institutes or public transportation organizations – are necessary as partners in many projects. Such a wider political support-network does not exist in a satisfying

measure for a lot of ppps. In many cases short-term interest of single political actors conflicts with common long-term goals. Two current examples from - again - eastern Germany are significant for this problem. The planned airport Berlin Brandenburg International (BBI) and the Warnow-Tunnel in Rostock are in a very difficult financial situation because of conflicts between the EC and national, federal and local governments in Germany².

- The neglect of political long-term interests in the frame of public-private collaboration corresponds in most public-private joint ventures to a lack of concrete goals. In economic terminology it could be said that the exact products, customers and market conditions are, in many cases, not defined very well. This vague formulation of goals often makes project management and coordination in joint ventures very difficult. Furthermore, several public-private projects in some regional policy fields do the same job because they have the same vague goals. In Germany and the Netherlands for example this problem is documented very well for the policy field of local and regional economic subsidies: almost every public or half-public organization is engaged in this field, but there often is no clearing center. This lack of coordination results in individual regions often having several projects being founded which have overlapping concepts. This regularly leads to inadequate financing of all the projects due to unproductive competition.
- One last crucial point for many public-private collaborations which work with financial support of the EC and national or federal government(s) is the long-term dependence on this support. Or, conversely: many public-private joint ventures only work successfully as long as additional governmental money flows. In many cases regional public and / or private organizations combine their financial engagement with extra support and fail to make themselves independent of it early enough³. This result stands in strong contrast to the intention of almost all regional governmental programmes that an initial short-term support should encourage sustainable public-private activities.

The general disadvantages of public-private partnerships described can for German cities be supported by the previously presented quantitative results of the survey. The following table 3 shows this through a success balance of public-private cooperation in the frame of communal administrative modernization from the year 1996⁴.

² Compare Frankfurter Rundschau, 28.9.98, page 3.

³ This effect is strengthened again and again by the fact that certain market conditions – for example real-estate prices or rents in technology parks – develop differently than originally calculated by the public and private partners.

⁴ For these results from quantitative surveys in Germany there is also currently no comparative data from other countries available. Results of qualitative case studies from France, the Netherlands, Great Britain and the USA can be referred to though as they demonstrate a similar assessment (Kreukels/Spit 1990, Fainstein 1994, Castells/Hall 1994, Naschold 1997). Table 3 refers to the general modernization of German local public administrations although ppps are in almost all of the questioned cities an important element of this general modernization.

Table 3 Change in the communal range of service through public-private cooperation in Germany (self evaluation⁵)

Performance aspects	Stagnation (in %)	Suggestions for improvement (in %)	Improvement (in %)
Offer	23	45	32
Service for big customers	39	41	20
Service for citizens	16	26	58
Profitability of the production of goods	8	29	63
Consideration of citizen's ideas	30	46	24

Source: Survey of Administrative Modernization in Germany in the Year 1996

Table 3 shows that through public-private cooperation primarily internal administrative processes of creating and making available public services are made effective. Thus the majority of those communal leaders questioned claimed that clear improvements have been seen in "service for citizens" (58%) and "profitability of the production of goods" (63%). The success of ppps in far reaching demands is seen as much more reserved. When dealing with the creation of new products or services as well as a heightened customer or citizen orientation ("service for big customers", "consideration of citizen's ideas") the corresponding majority of those questioned (45, 41 and 46%) only see partial improvements so far. The wish for product and process innovations has therefore only partially been filled by public-private partnerships.

Given the general advantages and disadvantages of ppps shown, we can distinguish roughly two main public-private strategies: an older "Anglo-Saxon" and a newer "European" one. This comparison can be taken as a base from which to formulate some general helpful conditions for the shaping of public-private joint ventures in the field of regional knowledge transfer.

4 Conclusion: Public-Private-Partnerships as a Suitable Instrument for Regional Knowledge Transfer under Certain Circumstances

Figure 5 presents the Anglo-Saxon and European model of public-private collaboration in one picture⁶. Main characteristics for the European type of public-private collaboration are stronger instruments of political control⁷, less engagement of purely private capital and a generally smaller scope of the projects. Therefore risks and profits are restricted. Next to this, the portion of non-commercial goals and involvement of affected citizens is on the whole more strongly represented. This type of ppp is dominant for example in the Netherlands, the Scandinavian countries and Germany.

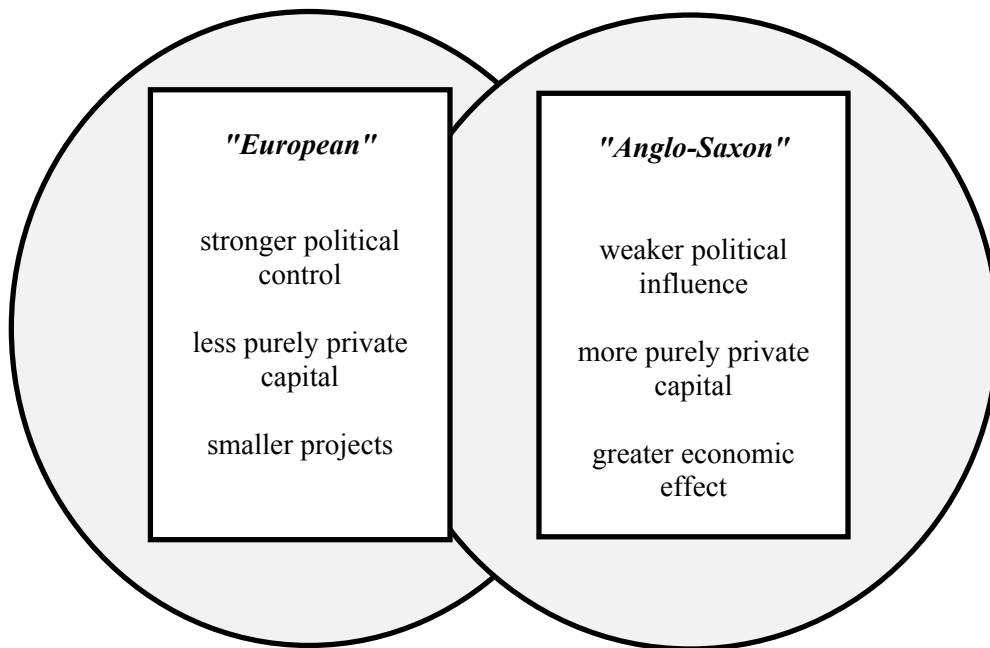
⁵ It must be observed in these success evaluations that communal leaders also assess the results of their own activities. The items represented had a 5 point scale as basis (between "no improvement" and "very strong improvement") in which the two positive and negative types were each summarized in a single category (n = 55 to 62).

⁶ For an organizational theoretical derivation of this comparison see Gerstlberger 1999.

⁷ This happens in addition to the use of regular company instruments in community organizations such as company meetings and annual reports.

The outcome of the Anglo-Saxon type is more extreme in "light and shadow"⁸. Because of weaker political influence and more direct participation of private capital the economic effect of Anglo-Saxon public-private joint ventures is greater than in (middle) Europe. But there are also some important economic and social "flops" in this tradition - perhaps best known is the failure of the London Dockland Project in the late eighties (Fainstein 1994).

Figure 5: Public-private collaboration: "European" and "Anglo-Saxon"



Remembering the general advantages and disadvantages of public-private partnerships explained a compromise between the Anglo-Saxon and European type leads to some conditions for a more successful design:

1. Public-Private-Partnership is an organizational form which should be reserved for strategic and long term projects of regional knowledge transfer. The great effort involved in coordinating formal public-private cooperation is only justified in planned projects which can not be carried out by either the public or by private companies alone. The political and economical goals of public-private cooperation should, on the forefront, be as precise as possible and should be put in writing in the form of a detailed contract by all parties involved. Beyond this the development of partial goals for individual project phases is advisable.
2. The citizens, customers or potential users of the products or services of public-private cooperation should be integrated as early as possible and systematically into the project organization. Expensive mistakes in development or lengthy conflicts in the implementation phase of public-private projects can be avoided in this manner.
3. Successful public-private cooperation needs a compromise between the necessary (legal, financial) self sufficiency and flexibility of the individual partners as well as the

⁸ The Anglo-Saxon type of PPP is especially wide-spread in the USA, Great Britain, Canada, Australia, New-Zealand and in a few new industrialized areas (such as South East Asia or South America).

political wish that these forms of cooperation be bound to local or regional self-governing bodies. The efforts of the responsible political bodies should not only be directed toward the concrete progression of a project but on the future coordination with other affected institutions on the different political levels. The wider legal and economic frames have to be an important part of this political coordination between the regional, federal, national (and European) level.

4. Additional financial subsidies from the EC as well as national or federal ministries are often vital for the initial phase of public-private cooperation. The economic and time planning of individual projects should nevertheless be structured so that independence from subsidies can be achieved in the mid-term.
5. Information management in public-private multi-actor networks plays a central role in the success of projects. Institutionalized forms of information exchange and individual key persons who serve as "linking pins" between public and private spheres are therefore elementary components of every cooperation. The early integration of local unions and personnel representatives is recommended on the public side when the work conditions of the administrators are changed through public-private cooperation.
6. As the various actors in public-private partnerships as a rule stem from different professional cultures room for maneuvering in project planning is necessary in order to balance work and communication styles. This is especially important when there is no local experience with public-private cooperation to be built on.

Despite the obvious problems of public-private cooperation presented, this organizational form of collaboration cannot be done without for the successful development of regional knowledge transfer. Precisely these central initial projects cannot be realized by either the public administration or private companies alone. These types of leading projects are always dependent on a comprehensive as well as far reaching political foundation and feedback.

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Public knowledge, private property and the economics of high tech consortia¹

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1 - Introduction

This paper addresses the issue of the privatization of knowledge. That is to say the extension of the private sectors towards areas and fields of knowledge production activities which were previously organized under the principle of public goods and which were funded through public subsidies. This tendency can take many various forms. Among them, we should keep in mind:

- i) the increasing fragmentation of the knowledge base by market-induced restrictions on access which arise within individual sectors where rivalry previously was organized (and restrained) under « information pooling » and openness;
- ii) the enhancing of the patent system through various institutional and legal changes;
- iii) the creation of private rights on fragments of generic knowledge which creates « anticommons property » eventually forcing companies to divert resources from socially desirable fields of research; and
- iv) the extension of university patenting (as a result of the new legislations which allow universities to obtain title to inventions developed with public funds) which may involve restrictions on publication before patent applications are filed.

Such a general tendency towards knowledge privatization is an ambivalent phenomenon:

- On the one hand, this is a good news for the tax payer! Any new commitment of the private sector to undertake research previously funded on a public base relieve the tax payer of the burden.
- On the other hand, all those situations raise serious questions regarding the impact of private property which can impede the dissemination of knowledge in the society and eventually reduce the social efficiency of R&D and innovative activities.

The goal of this paper is to show too what extent the model of collective invention - in its formal and explicit organization - can provide a class of solutions to those problems - the origin of the solution being that high tech consortia generate a new category of knowledge, neither public nor private but collective.

2 The microfoundations of the economics of knowledge

2.1 Non exclusivity and the underproduction of knowledge

Knowledge is a good which is non exclusive or more precisely it is costly to make it exclusive and to privately control it. Knowledge is highly portable and fluid. It is far more difficult for a company to protect intellectual property (ideas) than physical property (machine-tools); and social organizations have a certain degree of porosity with regard to

¹ This paper draws heavily on my works with P.A.David (David and Foray, 1995) on the economics of knowledge distribution.

their intellectual capital. Mansfield (1985) measured these involuntary spillovers and showed that information concerning R&D decisions is in the hand of rivals about 6 months and concerning the technical details leaks out within about a year.

The implication of that property is that the expectations of appropriating benefits from a successful innovation are highly uncertain. An inventor should realistically anticipate receiving something less than the gross social return from his or her inventive effort. The benefits not captured by producers of the improved technology - the external benefits from producing new knowledge - accrue to consumers. Thus, as in all cases of external benefits, private (the firm's) marginal revenues will be less than social marginal benefits with the result that too little, from society's point of view, is invested in innovative effort (Arrow, 1962, Machlup, 1982). The market mechanism has, thus, a tendency to discourage the production of public goods because of an inability on the part of producers to appropriate fully the value of the fruits of their efforts.

2.2 Two « natural remedies »

There are two ways through which agents can « spontaneously » overcome that problem:

- First, the argument on non exclusivity rests on a view of knowledge as information which must be qualified. In fact, inherent in the new knowledge (just discovered) is a certain degree of « natural excludability » (Zucker and Darby, 1998). Knowledge in its early stage of development can hardly be reduced to a « formal set of instructions » possessing the attributes of pure information. New knowledge is rather a combination of codified informations and some elements of tacitness which are neither portable nor fluid since they are embodied into human agents. Rather than being completely slippery and free-flowing, some parts of the knowledge remain « sticky », to use Von Hippel's ways of referring to the difficulties of transferring engineering knowledge from the sites at which it is generated (Von Hippel, 1988). As a consequence, tacit knowledge is a transitory source of intellectual capital, yielding rents for those who possess the knowledge. But if tacit knowledge seems, thus, to be an efficient means for impeding spillovers and keeping private control on knowledge, it cannot be considered as a serious strategy to be engaged by a firm for protecting its intellectual capital. The cost of keeping knowledge tacit can be very high in many contexts and can raise a lot of severe problems of coordination (storage, transfer, communication) and a company must codify a certain part of its knowledge base. As knowledge ages, it becomes more codified, systematized and articulated into public codes, so that it slowly loses its attribute of natural excludability to take the general characteristic of a non exclusive good giving rise to the market failure problem described above (Cowan and Foray, 1997).
- Second, another « spontaneous » remedy is for agents to engage bilateral relations in order to internalize the external benefits. Coasian approach suggests that the existence of externalities tends to induce the creation of institutions which internalize the externalities. The natural tendency for the creation of these institutions - taking the form of R&D consortia - reduces the size of externalities and the need for government policies to correct the market failure caused by the characteristics of knowledge. It is, however, a limited remedy because of the infinite scope of spillovers in case for generic ideas or general purpose technologies. And the more the cooperative

arrangement is extended the higher the costs for organization and coordination; so that it is out of question to create national monopoly for internalizing all externalities.

2.3 Public economics and generic institutional devices

Two generic remedies have been devised to overcome the deficiency of the market in this regard. One do so by seeking to rectify the problem at its source, whereas the second solution applies correctives in the form of supplements to the market outcomes.

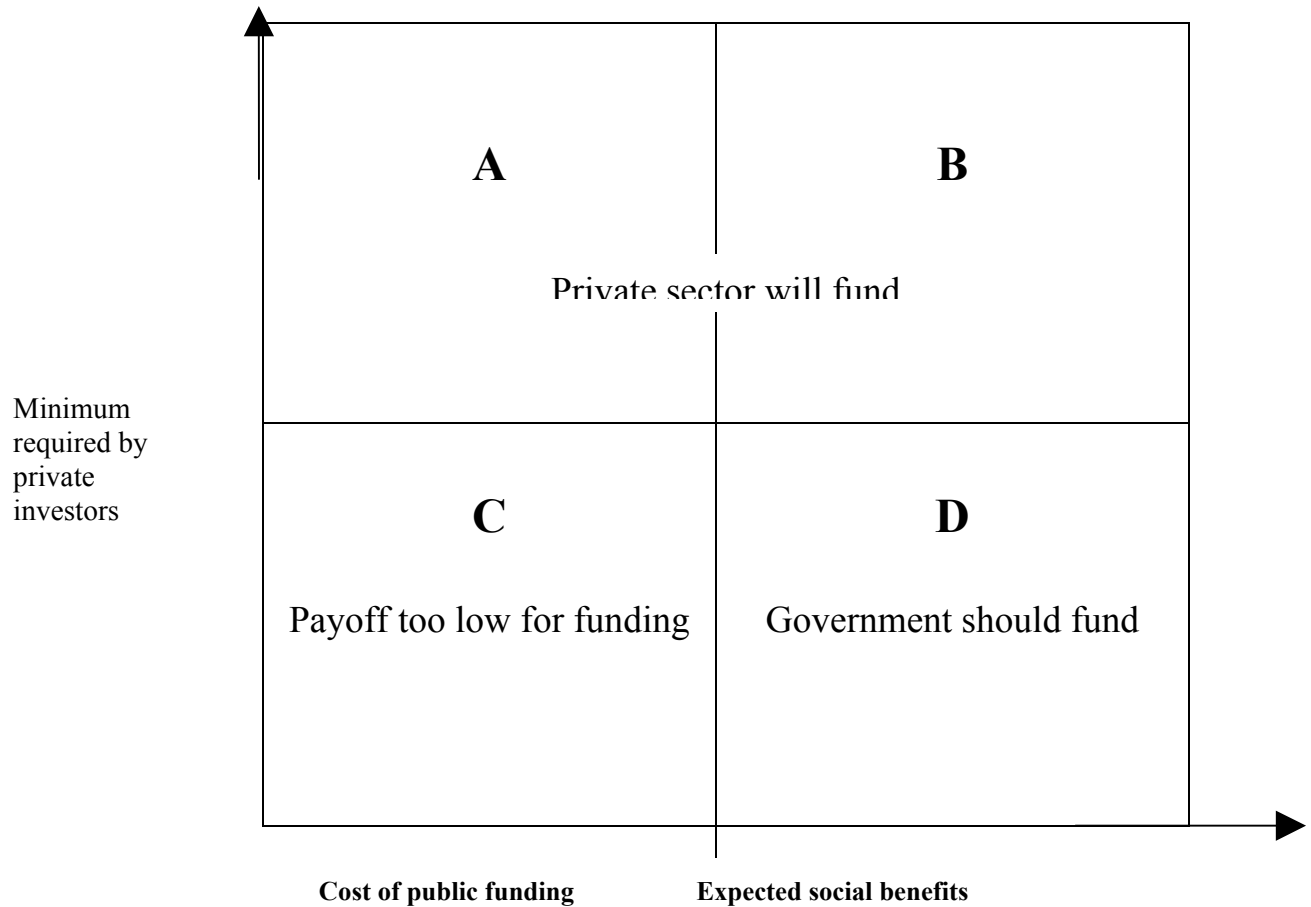
The first scheme on which we will discuss below is for the society to grant intellectual property rights to private producers for their discoveries, and permit them to charge fees for their use by others. This creates private markets for knowledge and gives rise to « private knowledge-products ». Patents and copyrights are means of defining and protecting intellectual property rights. From a policy point of view, legal dispositions aiming at restricting knowledge use, can be complemented with R&D subsidies (R&D tax credit, or direct subsidies) to help private agents to cover the costs of the resources which are engaged in the process of innovation.

The second possible scheme is for society to encourage private production of knowledge by offering public subsidies for its production, and by relying upon general taxation to finance these subsidies. A critical feature of this arrangement is that producers are denied exclusive rights to the output of their R&D activity: once it is produced the knowledge is made freely available to all who care to use it. This scheme characterizes research activities carried on in public institutions, such as universities, where much of the knowledge that is produced is prohibited from being patented by the private individuals involved in creating it, and where salaries and promotions and equipment are paid out of public funds.

Both solutions cannot be used equally to any kind of knowledge (Zucker and Darby, 1998). In some cases, the benefits stemming from the exploitation of knowledge *cannot* be privately captured because commercial applications are too uncertain or deferred for a long period of time and/or the knowledge considered is impossible to control. In some other cases, the benefits *should not* be appropriated by private interests because this knowledge is so fundamental and so crucial for important social problems that if other people were deterred from using it because of a high cost of or a refusal to license by the discoverer considerable social loss could occur (see the last World Bank report, 1998, on this point). In both cases, the second solution (based on public subsidies) should apply.

The following table explains how both solutions are distributed:

Table 1: Private and Social Benefits from Research and Development



source : Brown, 1998, p.45

The private sector supports R&D if its prospective returns exceed some minimum which occurs in A and B (which depends upon the possibility of controlling knowledge as well as the degree of certainty or risk regarding commercial applications). Government funding would be justified only for projects in quadrant D, which the private sector could not find sufficiently attractive and which have, however, high social returns.

The horizontal boundary between B and D is rather fuzzy. This zone is concerned with the so-called « use-inspired basic research »; that is to say projects of fundamental nature that are stimulated by practical concerns. There is no stable institutional arrangements regarding the use-inspired long term research: institutional patterns continuously fluctuated between large companies commitment and public support (through the funding of national technological programmes). It is in this domain that national specificities are strong: in the U.S., much of this class of R&D has traditionally been carried out at central corporate research laboratories; while in France this portion of long term research has been mainly supported through large publicly funded technological programmes.

Boundaries between public and private sectors can move, if the minimum level required by private innovators is going down. For instance creating excludability on new classes of knowledge (e.g. the human genome) may induce private individuals to undertake

beneficial research. In principle, establishing incentives and setting up new property rights (or extending them) combined with R&D subsidies (R&D tax credit) to help private agents to cover the costs of innovation can dramatically push down the minimum level required by private investors.

Boundaries can also move towards the other direction: private companies may abandon some fields of research when the expected private profitability is going down even if the expected social benefits remain very high. As a matter of example, a "Manifesto" recently published in *Nature* is denouncing the fact that today the pharmaceutical industry is abandoning malaria research - just as the explosion of parasite resistance to drugs makes it more pressing than ever to find new drugs². The reasons are certainly fairly rationale, at least in the short term; but the result for the society is that the global spending on malaria research by both public and private sectors is sharply declining -- spending on cancer research in the UK alone is double than spent of malaria research world wide. The question which thus arises is whether a new institutional infrastructure could replace the large corporate labs "*if, even with incentives, they fail to resurrect themselves*" (Ehrenreich and Brooks, 1997).

Until now, we described a quite simple problem: the design of strong intellectual property rights and the creation of conditions for enforcing the laws provide a class of solutions which respond quite effectively to the market failure by creating exclusivity and restricting the use of knowledge. There is however an unfortunate complication. Restricting the use of knowledge is, however, not a desirable policy objective. Knowledge has some other attributes which make it socially desirable to widely and quickly disseminate the innovations and new ideas which are produced by private agents.

3 - Distribution and the growth of economically available knowledge

3.1 - Knowledge is non rival and cumulative

There has been a recent resurgence of the view that in the realm of knowledge production, positive externalities dominate. In other words, the generation of a new piece of knowledge increases the probability of useful new products, processes and ideas arising from novel and unanticipated combinations. This is reflected in P.Romer's (1993) emphasis upon not only the so-called « non rival » character of ideas available for application in conventional production, and the consequent increasing returns to investment in R&D, but also on the notion that new knowledge promotes ever more product specialisation, and essentially unbounded growth of productivity and welfare improvement from that source. David's (1993) attention to the impediments that intellectual property protection poses for innovation, based on the related notion that a major use of new knowledge is as an input into further production of knowledge, also has greatest force in situations in which the returns to increased round-aboutness of knowledge production are not diminishing at the margin, but instead increasing.

All of those arguments are based on that knowledge is non rival and cumulative:

- Knowledge is described as a « non rival good »; that is a good which is infinitely expansible without loss of its intrinsic qualities, so that it can be possessed and used jointly by as many as care to do so. Transferring knowledge can be thus defined as a

² - "The Spirit of Dakar: a call for action on malaria", *Nature*, vol.386, April 10, 1997

positive sum game (while transferring any kinds of rival goods, such as a clock or a tool, is a zero sum game).

- Knowledge can hardly be only considered as an output; it is also the main input of any process of knowledge generation. Cumulative forms of knowledge are those in which today's advances lay the basis for tomorrow's, which in turn lay the basis for the next round (Scotchmer, 1991). What is impeded by restriction on knowledge use is, therefore, not only the individual « consumption » of few agents, but it is the infinite number (non rival good) of innovative opportunities which arise from new combinations and integrations (cumulative goods).

3.2 Policy implications

A new policy challenge about the distribution of knowledge is, thus, emerging as an important feature of the knowledge-based economy: the wider the use and the faster the distribution of that new knowledge, the greater the benefit to society.

Such a policy re-orientation is based on various arguments that an efficient system of distribution and access to knowledge, whether at the local, regional, national or international levels, will increase the social value of both the knowledge that is being produced by experience-based learning and organised research conducted within those economic entities, and the knowledge acquired and assimilated from external sources. This effect is not confined merely to the application of existing knowledge in the production of conventional commodities; it extends also to the use of information to produce more information:

- Wider distribution and timely inexpensive access to new findings reduce wasteful duplication of effort in research.
- By putting information into the hands of a more diverse population of researchers, these conditions tend to increase the probability of useful new products and processes arising from novel and unanticipated combinations.
- The social value of knowledge is increased by lowering the chance that it will reside with persons and groups who lack the resources and ability to exploit it.

3.3 Current tendencies

In the case of knowledge, however, a condition of « efficient distribution and utilisation » is not something that can be expected to arise automatically from the interplay of market forces. The different incentive structures and social organisations typical of the different kinds of learning activities may interfere with this. In other words, the improvement of the « distribution power » of the system is seen sometimes as a desirable objective that has to be sacrificed in order to provide stronger market incentives for private investment in organised R&D, since copyright, patent and trade secrecy laws create obstacles to access which restrict the commercial utilisation of knowledge. But those same impediments also may stand in the way of the use of existing knowledge for innovation itself.

There are, thus, some current tendencies which seem to conflict with the knowledge distribution challenge and upon which we will turn now.

4 Towards the privatization of knowledge

This part is focussing on the economic and policy implications of the current tendency towards the privatization of knowledge. Too many exclusive rights can generate overcrowding and congestion in a given technological space. This conduces in turn to an increase of transactions costs (for trading rights), and litigation costs; leading eventually to an underuse of knowledge and a change in the market structures. We will take one case of increasing fragmentation of the knowledge base by market-induced restrictions on access. This case arises within individual sectors which were previously organized under the norms of public knowledge or of weak intellectual property rights.

Biomedical research was organized under the principles of common resources. Under this model, the government sponsored premarket research and encouraged broad dissemination of results in the public domain. Unpatented biomedical discoveries were freely incorporated in downstream products for diagnosing and treating disease. In 1980, Congress began encouraging universities and other institutions to patent discoveries arising from federally supported research and development and to transfer their technology to the private sector. Such a change towards privatization holds both promises and risks.

Patents and other forms of intellectual property protection for upstream discoveries may fortify incentives to undertake risky research projects (on table 1, establishing incentives and setting up an efficient regime of property rights for activities which previously were funded by the government, may result in moving these activities from quadrant D to quadrant B). But privatization can go astray when too many owners hold rights in previous discoveries that constitute obstacles to future research. Upstream patents, initially offered to help attract further private investments, are increasingly regarded as entitlements by those who do research with public funds. The result has been a spiral of overlapping patent claims in the hands of different owners, reaching ever further upstream in the course of biomedical research.

Researchers and their institutions may resent restrictions on access to the patented discoveries of others, yet nobody wants to be the last one left dedicating findings to the public domain. Heller and Eisenberg (1998) describe such a situation as a «tragedy of anticommons» where multiple owners each have a right to exclude others from a scarce resource and no one has an effective privilege of use. In a world without transaction costs, people could always avoid anticommons tragedies by trading their rights. In practice however avoiding tragedy requires overcoming transaction costs, and strategic behaviors.

There are two mechanisms which makes this tragedy particularly strong in biomedical research (Heller and Eisenberg, 1998):

- Patents are now granted on gene fragments before identifying a corresponding gene, protein, biological function, or potential commercial products (while throughout the 80s, patents on genes generally corresponded closely to foreseeable commercial products, such as therapeutic proteins or diagnostic tests). Such a new patenting orientation increases the fragmentation of fundamental knowledge, like DNA sequences. But we know that foreseeable commercial products, such as therapeutic proteins, are more likely to require the use of multiple fragments. A proliferation of patents on individual fragments held by different owners seems inevitably to require costly future transactions to bundle licenses

together before a firm can have an effective right to develop these products. Unable to procure a complete set of licenses, firms can choose to divert resources to less promising projects with fewer licensing obstacles.

- The use of reachthrough licenses agreements on patented research tools is a second mechanism: an RTLA gives the owner of a patented invention, used in upstream stages of research, rights in subsequent downstream discoveries. Such rights may take the form of a royalty on sales that result from use of upstream research tool, an exclusive or non exclusive license on future discoveries, and so on. In practice RTLAs may lead to an anticommons because they give each upstream patent owner a continuing right to be present at the bargaining table as a research project moves downstream toward product development. Although this mechanism was established to help researchers with limited funds to use patented tools right away and defer payment until the research yields valuable results, one effect is to block an entire field of research.

5 - Solutions

Two problems are rather different: first some knowledge is privatized in spite of the « should not » argument. Second, in some sectors privatization of knowledge leads to situations in which anticommons problems can occur.

5.1 Coping with the extension of property

There are many reasons for keeping some classes of knowledge in the public domain. The « should not » argument (above) should apply here when the knowledge is so fundamental and so crucial that if other people were deterred from using it because of high cost or of a refusal to license by the discoverer considerable social loss could occur (and we also know that the mechanism of compulsory licensing is not a tool which can be widely used). The solution to this problem is found in the establishment of some public agency. The agency could decide to buy knowledge for the public's use when it seemed warranted. If the seller would not agree to sell at a reasonable price, adjudication principles very similar to those used in eminent domain land-acquisition could be used. A rather similar and exciting solution is the so-called « patent buy-outs » system: the government buys a patent and then makes the technique freely available. Such patent buy-outs combine some of the advantages of direct funding of research and of the patent system. It remains, however, the problem of determining the price. Kremer (1997) discusses a mechanism through which the private value of patents would be determined using an auction.

5.2 Coping with the proliferation of rights in the private sector

Beyond the issue of maintaining some fundamental knowledge into the public domain, one problem remains which deals with the fact that too many rights may overcrowd the technological space, which in turn may have a negative effect on innovations because of the high transaction costs which are induced by the necessity to exchange or bundle private rights (or because of fear of litigation costs).

Two policy approaches exist. The first one deals with serious patent policy aiming at working on many dimensions of the patent system in order to slowdown the overcrowding of technological spaces. The second approach is to promote collective forms of « pre-competitive » R&D (high tech consortia, industrial collective research) which make

knowledge « collective »; so that the establishment of collective rights can avoid anticommons problems.

5.3 Collective invention

The emergence of new rationales for collective invention extends and strengthens the significance of the process of 'collective invention' which has, in any case, been growing throughout this century due to the progressive division and specialisation of labour and as a response to growing research costs). In this history, some kinds of collective invention patterns were tolerated within the national system of innovations, with some playing even a major role in certain sectors (e.g. nuclear power or aeronautics). However, the proliferation of experiments and new patterns of cooperation and the importance of new organisational designs for consortia show that collective invention is no longer only tolerated by the system of proprietary research but is becoming a central organisational feature of that system.

The existing understanding is that collective invention is an efficient way to internalise the positive technological externalities associated with knowledge production, to reduce wasteful duplication of R&D investments, to improve the diffusion of new knowledge and to optimise the selection of technological standards. This understanding inadequately captures some of the key roles that collective invention plays in copying with the extension of private property. Most important is the role of *ex ante* minimizing transaction costs and facilitating coordination in areas in which intellectual property rights tend to proliferate, given the new conditions for private appropriation. This can be achieved by generating a new class of knowledge - neither private nor public - which is collective.

Such arrangements raise, however, important issues about the attribution of property rights and the circulation of knowledge. The importance of those problems arises from three tensions which characterize the organization of research in such collaborative projects:

- sharing information within the consortium for promoting collective invention versus enforcing a certain degree of individual protection (tension between individual and collective);
- ensuring priority of access for the participants versus promoting external distribution (tension between internal and external);
- encouraging publication for academics versus preserving right of exclusivity for the commercial enterprises (tension between various « institutions »);

In a new project³ we investigate the main features in those processes of building new mechanisms for collective invention: i) the emergence of something which is rather new in the field of intellectual property right which is the creation of institutions for the management of collective property rights; and ii) the conception and implementation of

³ - COLLINE is a TSER project (EC funded), involving SPRU, Manchester Business School, the Rosselli Foundation and the University Dauphine, which aims at investigating processes of « collective invention » in various industries.

complex schema of distribution of data, ensuring a gradual process of collectivization of knowledge.

In the particular case of high tech consortia for biotechnology, we have established a typology of intellectual property right attribution (Cassier et Foray, 1998). Intellectual property rights can be:

- dis-jointed (each participant is entering with its own property rights and will keep them individually. Data are sharing collectively to generate information from the amalgamation of collection of data; but each exploits those data on its own domain and appropriates privately the results. Intellectual property rights are attributed at the end to each industrial partners on the results generated in its own field);
- divided (individual and temporary rights are attributed on particular segments the sequencing of which is done by a given partner);
- collective (the rights are collective and their management is assumed by a third party which has to establish rules for payments as well as for the repartition of exploitation rights);
- spontaneously claimed by individual partners (competences asymetries among the partners can lead to private appropriation).

Thus, only few consortia are clearly implementing collective property rights as well as complex schema of data circulation. Only few cases are really dealing with collective knowledge and can cope with the anticommons problems. In most of cases, the solutions which are implemented at both levels (property rights and data diffusion) provide partners and participants with practices that approach the idea of « perfect community » to varying extent. Thus, our investigation at both levels allows us to characterize various forms of community exhibiting particular properties of coordination and efficiency regarding the process of collective invention.

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KNOWLEDGE TRANSFER IN THE INFORMATION AGE

THE 1998 AUTUMN CONFERENCE OF THE SIX COUNTRIES PROGRAMME
Budapest, 19-20 November, 1998

Background paper

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The author formulates some basic statements concerning the essential issues of the Budapest Conference of the Six Countries Programme in order to stimulate participants' ideas. The statements presented here are therefore arguable. By presenting these views the author attempts to give a brief survey of the phenomena and observations stemming from the literature of the field. The questions and answers discussed in this outline are fragments, and intentionally not a coherent text.

I. Information society and knowledge based economy: a reality or just catchwords?

Market economy or information society?

- Over the last two or three decades we have witnessed *radical changes in the mode, speed and nature of knowledge transfer as a result of the diffusion of new information technologies*. Information flow between companies and individuals is not just a secondary concomitant of material processes, but an important if not dominant process of the economy by itself. It is expected that the production and distribution of knowledge will get in the focus of all economic activity by the turn of the millennium.
- Information providers, carriers of electronic information, hardware manufacturers and software developers will therefore become major sources of economic progress in the developed countries. Analysts "...tend to place recent developments in information and communication technologies...in the context of discussion of the massive changes associated with what is variously called *post-modernity, the post-industrial age, post-Fordism...new times, globalization, the information age, disorganized capitalism...and so on*. Whatever their title, their stories are of dramatic, irreversible, life-altering, unpredictable change." (Winner [1997] p. 990.)

1. ***Does it also follow that knowledge capital dominates real capital? Or does knowledge remain the hostage of traditional capital due to the fact that its use in economy demands huge capital investments? Does the market economy use the information revolution to revitalize itself, or does the emerging information society use real and financial capital as its base?***

Hyper-competition versus co-operation

- Organizations and individuals that fail to install the most modern IT-equipment and to apply the latest manufacturing processes necessarily become *losers* while actors adopting the latest information and communication technologies *remain competitive* (Angell [1996]). The economic success of nations does not depend on the production of goods anymore as trading the skills and knowledge gradually become the main wealth creating factor. (Thurow [1996])
- Radical changes may also occur in the ranking of companies. Large companies comfortably enjoying the security of their monopolistic situation have to see smaller - sometimes infant - enterprises supplanting them. General Motors, leading the company list for decades slipped back by a few dozen places, while firms in the electronics industry hardly figuring on the list of the 50 largest companies one or two decades ago, currently have illustrious places. Similarly, individuals' positions are also becoming highly determined by knowledge. People under 30 can manage global companies or giant banks, while powerful managers' decennial carriers can be in ruins in a moment. Rapid *technological changes devalue everything rigid or hierarchical* and prize adaptability and flexibility.
- Though the reranking force of information technologies is more or less known to all, whether actual adaptation will follow the perception of the process is an open question. Perhaps some actors will choose defensive strategies instead of adaptation - strengthening positions, instead of learning. But defensive firms and people will be excluded from the competition. Companies labouring to reinforce monopolistic positions will lose them and people who do not learn will find themselves on the periphery of the society. There is no capital, monopoly, position, tradition, privilege that can defend any nation, institution or individual from this threat.
- The hyper-competition among the firms and nations doesn't prevent them from close and long-running co-operation. Strategic knowledge is being developed interactively and shared within subgroups and networks of competing companies. Accessing and creating knowledge requires intensive and permanent communication and co-operation among firms, academic institutions, governmental offices and so on.

More equal distribution versus monopolization of knowledge

- Knowledge can also be misused as the *means of monopolization* and under given circumstances can become a *source of inflexibility*. This is especially true of information-based competition in which rapid technological advance is a constant threat to the applicability of an organization's existing competencies. But impeding knowledge flow can easily hit back. The firms that attempt to preserve themselves in their privileges, are not capable of absorbing experience of others and using it for upgrading their own technologies. Instead of strengthening organizational rigidity and blocking the flow of information, knowledge could be used to focus a company's search for new opportunities through incremental enhancements to an existing system.
- In the information age there are convincing arguments both for the democratization of knowledge and for the opposite. Nevertheless, since information as a resource is infinite, one can hope that its monopolization - following from its very nature - is much more difficult than that of steel or oil. Moreover, in the information age, monopolizing knowledge and creating obstacles in knowledge-transfer seem obsolete since *information is more fluid and accessible than ever in the past*. But at the same time the accumulation of information and knowledge by the academic and business elite means that information is condensed in some "hot spots" like large information collecting and distributing centers (stock-markets

and intelligent companies) which is in contrast with the required democracy of knowledge access. Based on the above mentioned trends we can formulate the question:

2. Will knowledge monopolization prevail against its democratization, or can we expect a reversal of this ?

II. The world of work in the information age

- The economic utilization of knowledge is an extremely capital-intensive process. Paradoxically, *not only the use of knowledge needs giant investments, but also bringing it to life and its dispersion*. Mass education and worldwide electronic networks require investment of capital amounting to billions of dollars. So *education*, which was traditionally separated from business, has, in the natural course of things, *become a robust "industry"* increasingly characterized by standardization, and organized into a well-controlled technological process led by market logic. The carrier of knowledge, the *knowledge worker, is an expensive commodity*; one that cannot be found on the market in a perfect form, and the firms' having them also means a supplementary investment in the form of recruitment, selection, training and retraining. One of the leaders of the American *TA Associates* describes the shift of emphasis in investment policies from machinery and equipment to investments in knowledge as follows: "We don't want to invest in hard assets. They are too short lived and risky... *We want to invest in people*, who have a clear viable concept, who can manage outside contracts with the best sources in the world, and who can concentrate their internal energies on that small *core of activities* that creates the real uniques and value-added for the company." (Quinn [1992. p. 49.]). An increasing amount of managers of large companies deduce that it is risky to freeze capital in physical goods like bricks and tubes when the times are capriciously turbulent. One larger technological innovation could easily turn material investments into obsolete and useless junk. It is a much more sensible strategy to invest into individuals' intellect or special skills. Large profits are not to be reaped from the units or parts of the goods, but from the 'soft factor', i.e. intellectual services within production processes that integrate the smaller components into a unified whole. But acquiring knowledge is a huge investment not only for companies, but for the individual as well.

Knowledge: investments in individuals. Diminishing or increasing return?

- The need to have the ability to make rapid adjustment to the change of the information society results in entirely new approaches to learning. People - urged by the accelerated obsolescence of knowledge - *consider learning as costly individual investment*, which needs satisfying return, within a reasonable period of time (Banner [1998]).
- Hyper-competition has commenced on the market of educated workforce as well. Requirements of efficiency and speed in acquiring new knowledge are an attempt to get adequate returns for the investment, and this moves knowledge workers towards new, more flexible forms of learning. Consequently, training practices must become more sophisticated and adaptable to meet the diverse learning needs of the new workforce (Wulf [1996]). Information technologies relying on *modular teaching* programs better satisfy consumers' demands. As in industrial trends, *computer-aided "production"*, "*mass customization*" enters education too. (Lee [1991]) *Education* - as a subsidized public industry - *becomes* more market-influenced. (Brown - Duguid [1996])

- Pioneers of education create *universities without walls* that are less expensive, more accessible to a new breed of students and sometimes what is on offer is also more relevant to the targeted career of the young (*Hettinger [1997]*). On-line universities can provide *increased access to higher education* for the booming student population *without building more campuses*. Of particular interest are the latest interactive *multimedia technologies* to be found on the *Web*. Some suppliers offer hundreds of courses from universities all over the world, many with multimedia components. (*Kaplan [1997]*) This type of education - radically decreasing diploma-related individual investments - brings big economic benefits for the future workforce. Nevertheless, the above mentioned trends raise a few important questions for the future:
3. *If we interpret education as an investment on the part of the individual and society, does it not lead to the moral depreciation and devalorization of knowledge before being able to produce adequate returns? Already, it seems that investment into knowledge is insufficient even in the most developed countries.*

Training as a by-product of work. Hyper-learning - convergence between work and learning

- Under the new conditions of the information age, *training* will emerge as a *by-product of work in interpersonal learning*. (*Bassi-Benson - Cheney [1996]*) . There is a definite convergence between work and learning. (*Tapscott [1996]*) Knowledge gained in a work situation is heavily dependent on the social climate of the workplace, i.e. whether the presiding conditions are supportive or restrictive towards knowledge-transfer between employees. The affluence of informal information-gathering and knowledge-sharing relationships can only be truly gleaned if personal contact between the employees is frequent and intensive.
- In the practices of firms we can witness a remarkable new method of learning: *hyper-learning* (*Matanovich - Cressman [1996]*) which combines the best practices of *action-based* and *simulation-based learning*. The process builds upon the participation of coherent work teams in which members develop shared beliefs, a uniform set of mental models, a common language, respect for the contributions of individual team members, and ultimately longer lasting learning. Hyper-learning promotes a strategic perspective, where fast reaction to the market, flexibility, and adaptability are the key elements of success.

Life-long learning: the key of survival

- Some decades ago, the life was divided into the period: when people learn and when they work. Most learned a competency—a trade or profession - for the whole life. The task of employees was simply to keep up with developments in their field. Recently one can expect to have to reinvent his or her knowledge base throughout his or her life. Nobody knows what a career plan is any more. Learning has become a continuous, lifelong process. Graduation with a four-year science degree, means that half of what the person learned is likely to be obsolete.

Flexible and versatile employees. Job security is a matter of the past

- Since production facilities may change from one day to the other, workers must be prepared for dramatic shifts in what they do. They must be *flexible* and *versatile*, employed within temporary teams that have ever-changing objectives (*Downs [1988]*). The number of *self-employed* and *contract workers* has been increasing constantly. Traditional modes of

employment are about to lose their significance. By the 1990s the formerly “*atypical*” employment has become typical. There is a growing common understanding among the employment experts that *job security is a matter of the past*.

- If the information society has the potential to create certain jobs, it will also wipe out others. The digital revolution has contributed to a *high degree of redundancy* and job obsolescence in the manufacturing industry and even more increasingly so in the *service sector*. Millions of jobs will be lost if teleshopping and telebanking really takes off. This trend leads to the decline of middle management and middle class and consequently leads to an ongoing unemployment and to the growth of underclass. (What is the...[1996])
4. ***Will the Gordian knot of unemployment finally be cut through by new kinds of employment (telework, labour-leasing etc.), which effectively eliminate the traditional way of employment?***
 5. ***Is unemployment unmanageable because we wish to restore the working conditions of an earlier epoch and the new technology does not permit this?***
 - The use of IT creates a new social division in the terms of “*information rich* and *information poor*”. A *dangerous polarization between* two categories of people can be observed: the intellectual, cultural and business elite (the mobile and independent knowledge workers) on one hand, and the rest (the immobile and dependent workers) on the other. (Angell [1996]) The knowledge workers have become the engine of any kind of development, but at the same time we have seen *accelerating impoverishment* of less educated population. Robert H. Frank and Phillip J. Cook [1995] are speaking about “*winner take all society*” in which the process for determining winners is not the productivity level, as in traditional mass production, but *knowledge, position or relative performance*. This results in rewards that may be several thousand times as great as that received by runners-up, despite a performance that is only marginally superior to those who follow. The consequence of concentrating rewards among fewer and fewer income recipients is the broadening of the income gap between rich and poor.
 6. ***It seems that the gap between information rich and information poor people is widening, while knowledge - in contrast with material goods - cannot be redistributed by taxation and social measures. Is there any solution? Or should we accept definitive split of the society?***

Hierarchy of experience versus hierarchy of imagination - obsolescence of the seniority principle

- The spreading of information technologies radically transforms the labour market. As flexibility and learning ability become main requirements of manpower, *young qualified people are appreciated highly while older ones are gradually crowded out of the labour market*. The hierarchy of experience has been displaced by the *hierarchy of imagination*, and the principle of seniority by the principle of juniority. For the first time in history new generations entering labour market not only have few things to learn from elder people, but elder people have to learn from them. An important question to be answered in the near future is:

7. Will labour supply - only capable of gradual change - be able to adapt to labour demand, the structure of which changes more rapidly? How can qualification acquired during decades conform to demands that change every day?

Teleworking and hot desking - Networked home as a workplace

- Networked homes will increasingly become networked workplaces. *Teleworking* (working from home or no fixed office) and *hot desking* (sharing office space with others on a "timeshare" basis) will produce a lower rate of demand for offices. This has many implications for the structure of society.
- Without a physical workplace for example, governments need to consider *alternative means of collecting taxes*. Another effect these changes are going to have on transport. As technology makes the world smaller, there will be *less need to travel*. These new phenomena will result in the ultimate deterioration and depopulation of urban areas, particularly downtowns (*Carruthers-Smith [1997]*).

III. Knowledge transfer in the economy

"Knowledge is the only meaningful resource today." (*Drucker [1993], cited by Clarke [1995], p. 28*) Corporation has begun to wrestle with alternative developing strategies and the implementation of knowledge strategies to achieve growth and increasing market share. (*Clarke [1998]*) Most of the efforts have been devoted to capturing information and developing software-assisted networks to link people of similar interests throughout the company's global operations. Companies often do not deal with selecting the knowledge assets that should be of first priority, even if the efficiency of such a selection can determine the learning ability of the firm.

The learning ability of firms

- Information technologies pervading the economy have made information much cheaper than it was in the past. Low-cost information has been of benefit to *flexible cooperation* as opposed to hierarchical structures and centralized planning. These reflect a shift of balance in work patterns to *mutually responsible teams*, rather than working individually. To become flexible enough, to react quickly, firms must allow employees to develop broadly based skills so they can understand a larger range of the production and distribution processes and hence actively participate in problem solving.

Teamwork: the space of interactive learning

- *Teamwork* often means managing a relationship with boss, peers, other employees, who live in different countries and have a different cultural background. The "glocal" employee has been a cog-wheel in the machinery of transnational networks and at the same locally tied to a particular point of the globe as well. (*Lacarrieu - Raggio [1997]*) The efficiency of "glocal" employee depends on cross-cultural communication, giving feedback and helping others to learn. In response to these changes, a *new management philosophy* has emerged: Firms are social communities that specialize in the creation and internal transfer of knowledge.
- Most of the employees possess and can develop significant knowledge and are the source of important innovations (process innovations) especially in conducive environments. The larger part of learning is done via the informal mode of *inter-personal information- and communication processes*. *Personal contact* is the most efficient way of gathering infor-

mation. As Heitmann [1990] puts it: Technology (and information) transfer is a „*body to body contact sport*“. Through inter-personal interactions, there are opportunities to study the problem from many perspectives, to get simultaneous feedback, etc.

Organizational learning. Knowledge transfer in business networks

- The most important factor in the business success of companies is no longer the acquisition of material resources. It is the ability to acquire knowledge, in other words the *ability to learn*. This change radically transforms organizations: the hierarchical organization is replaced by the *learning organization*. (Garavan [1997]) Organizations must routinely learn and relearn about their environment, as well as learn new ways to change and implement policies and processes. They show diverse styles and ways of *systems-level learning*, depending on their own business context: time, demands, resources, and competitive constraints. The contextual factors influencing learning styles include competitive strategies, company culture, industry- and product-life cycles, and technology.
- Organizational receptivity to learning includes the “*degree of openness*” of the firm, the degree of *pre-existing organizational slack*, and *management's commitment* to learning and improving the firm's array of skills over time (Hamel [1991]). There is a general opinion that the distinctive feature between progressive and underdeveloped firms is not the mere existence of a research activity as such. It is their *openness towards learning* and their willingness to share information. (Sinkula - Baker- Noordewier [1997]) The process of creating knowledge is an enormously expensive one, while its secondary application requires far more inferior resources. (See, for instance, the costs of software development versus the price of purchased software.) Three factors can be mentioned to facilitate learning: (1) the *mutual trust* which helps promote communication; (2) adoption of non-hierarchical structures that promote *coordination in problem-solving*; and (3) the provision of ample *opportunities for novice project members to learn* through participation in the common company activity.
- Companies will transform into *learning organizations*, therefore their structures must be developed to capture and share learning in. System-level learning and knowledge mean more than the sum of employees' learning capacity and intellectual capital. Organizations *synthesize* and then *institutionalize* the intellectual capital of their people, which is embedded in their cultures, knowledge systems, and routines - and in their core competencies. (Gephart et al [1996]) Learning organizations are often characterized by their *flexible team structure*. Team learning occurs through active dialogue and inquiry, focusing on *group development* and collaborative skills. Instead of simply friction or disagreement, the differences of opinion lead to new insights and problem-solving alternatives. The search for knowledge always involves *surprises*. In many cases ideas are of spontaneous origin, and their usefulness cannot be known or measured before implementation. (Minkler [1993])
- With the interaction within and between learning organizations, the *efficiency of gaining knowledge is higher* than in occasional informational acts. Recurring interactions contain less of a chance that the partners get incorrect or deliberately corrupted information. Also, *transactional costs are much lower* due to the lack of need to go through the complicated process of inspecting the quality of the information since there is a mutual trust between the partners.
- Another point is that problems can be more efficiently resolved in long-term knowledge-sharing interactions where the level of creativity and the frequency of innovative ideas are much higher. Even new ideas are more easily transformed from the abstract form to marketable commodities, and the time elapsed between the original idea and the actual mar-

keting is much shortened. *Synergic effects* characterize the relationship of partners working in a *personal contact network*.

- The intensive cooperation of the people in such a network is brought about by an *uninterrupted flow of information*. This ongoing process is similar to that of introducing the assembly line and the conveyor belt at the beginning of the century: the process-units of production which were previously separated in time and space became one unified and unbroken progress. Parallel to and within networks, the knowledge industry is born, with a continuous flow of information. As new information is arrived at, innovations are implemented, and - as network interactions proceed - innovations become a permanent feature of the industry. *Knowledge does not originate from a solitary genius-inventor* who conducts his research in his ivory tower, nor is it necessarily linked to any particular field of science. Knowledge mostly comes to life through the combination of knowledge-atoms gained through network-cooperation.
- As competition intensifies, firms will have to conceive, produce, and deliver a wide array of new products. This pursuit of continuous learning is the route to achieving renewable competitive advantage through "*anything, anytime, anywhere*" strategies. This thorough implication also causes a huge danger if research managers lose control of R&D within their organizations. For appropriate knowledge management, it is of great importance to develop the position of the so called "*knowledge broker*" who is e.g. able to use Web tools for helping the research community in collecting relevant information. (Slocum - McGill - Lei [1994])

Concerning the organizational aspect, some fundamental questions will be formulated:

8. ***What does the knowledge-absorbing ability of a company depend on? On the industrial cluster it belongs to? Or would the distinguishing feature rather be linked to the organizational structure of the company? Perhaps this ability depends on the culture of the hosting country, or on all of the factors mentioned above? Can organizations be conditioned to improve their learning ability from outside the organization?***

Inter-organizational learning: knowledge flow among industry, government and other sectors

Internalization of the knowledge market, supported and mediated by IT, will generate a high degree of knowledge sharing *among firms*. Because knowledge is a *public goods* which is *easily transmitted* across boundaries, its exploitation is logically an international operation. (Buckley-Casson [1976])

- The key to international business networks is *inter-organizational learning*. One has to see the international business networks not only as composed of individual learning organization, but as a structure capable of *inter-organizational learning*. The economy becomes a *hierarchy of networks*. This calls for focusing on the flow of information across the new knowledge transfer pathways. We can no longer observe knowledge transfer in any single organization. We need to adopt an inter-organizational perspective. A big part of knowledge is, in fact, dispersed. (Minkler [1993]) *Franchising* and *professional partnerships* are organizational forms that explicitly recognize the existence of dispersed knowledge.

R&D consortia: The pooling of resources from the academia and business

- As companies become increasingly aware that in-house R&D resources are no longer capable of being the sole source of the research, the "NIH" (*not-invented-here*) syndrome is rapidly being replaced by the "AIA" (*anything-invented-anywhere*) state of mind. (Bloedon - Stokes [1994]) Universities, recognized as the suppliers of talent, are potentially well positioned to become the prime knowledge supplier for companies. University and industry research programs (managed by a university principal investigator with a company representative and typically financed by the company), provide opportunities to meet the increasingly global challenge of competitiveness in technology. As research partnerships of this nature can take a few years to mature, the value of a long-term structured approach to program management is clear.
 - Administration of the collaborative research program can be handled by an agent thus letting the researchers deal with their real task--solving challenging research problems. The agent can facilitate and assist in the acquisition and use of the knowledge and of the tools that result from the solution of the problem, and recommend potential opportunities for further collaborative efforts. To build cooperation between the university and the company, one must be careful not to create bureaucratic hurdles (Bloendon - Stokes [1994]). The agent must be trusted and appreciated by the researchers. He or she can put the researchers in a position where their research program can make use of every opportunity to be successful.
 - Until recently most researchers have worked in the academic community. As they venture out into the business world, they discover that different rules apply. In the commercial environment, problems that have high payoffs and low technical risk are preferred. Those applications are selected which improve productivity and enhance products and services. Researchers must also undergo a *psychological transition* into the business environment, where they have to compete with other companies for a share of the market.
 - As a consequence of pooling university and business, a new organizational form, *the research and development consortium*, is spreading. Competing members of the same industry work together in it. (Evan-Olk [1990]) The pooling of resources among various competing members creates a new legal entity: a nucleus organization that conducts R&D and facilitates technology transfer among its satellite members.
 - A last option to be mentioned is to form a consortium, like in the U.S., carrying out R&D with a *federal lab*. Such formal agreements take two forms: in *horizontal consortia*, competitors pool their resources to do research that is of common interest to all. In a *vertical consortium*, a manufacturing company and its commercial agent work together with a lab to incorporate new technology into a product with a high probability of market success. The advantages of such consortia are that they allow reaching economies of scale, encourage the sharing of risks, set standards for new technologies, and they share complementary knowledge. A high degree of *heterogeneity* among the members of an R&D consortium (or a community) *can be a barrier* to collaboration. But if cross-organizational and technological leveraging are achieved, through horizontal and vertical integration, they may lead to important competitive advantages. This raises other questions:
9. *Will the world-wide trend of a business attitude urging immediate results and petty-minded calculations also prevail in the academic sphere, hindering fundamental research and original scientific discoveries? Does the pooling of academia and business threaten us with inheriting the wrong genes from both spheres: from the business world - preference of short-run objectives to the detriment of future, from academia - inclination to rigidity and slowness?*

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