13

CHALLENGES OF SLOVENIA'S TECHNOLOGICAL STRATEGY (Some thoughts)[1]

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Abstract *The author discusses Slovenia's technological strategy. Any strenghtening of technological capacities calls for cooperation with technological leaders, wherever they might be. This means that the priority of integration into Europe must not be the only (technological) strategy. It should rather rely on an ideal evaluation of the status of Slovenia as a small country in the world and the present stage of its development in science and technology.*

technological strategy, limitations of small countries, integration into Europe

1.Introduction

This paper[2] is slightly black-and-white, so that the issues may become clearer, although in real life they are not such. It is not my ambition to cover the whole topic but rather to point to particular segments. I remain restricted to some more general aspects of directing technological development as an integral part of the economic, or rather developmental, strategy of society as a whole.

2.Points of Departure

The first assumption is that a certain strategy of technological development is needed, but not as one more document which nobody is going to observe; we have witnessed this so many times in the past. Instead, it is needed as a vision of objectives to be achieved and well elaborated ways and means for their implementation. I do not understand objectives as a choice of branches or segments within branches or similar, but rather as the identification of very general goals such as added value maximization, increase in the quality of products and services in general, increasing the share of services in the social product and maintaining an autonomous development of Slovenia. I emphasize in particular the skill of governing since it implies fast response to changes and adjustment to circumstances rather than rigid clinging to some overly detailed objectives which a newly arisen situation can invalidate.

The second point of departure is that a general development strategy is needed much more than a technological strategy. Namely, technology - although nowadays the corner stone of competitive advantages of a country/firm - is but one of the production factors. Each soci-

ety/economy is not pursuing the best, the most modern technology (either their own or imported) no matter what the cost, but is rather endeavouring to optimize the use of the factors (local and those from the environment - the world) available. Various technologies can thus suit various economies. Or in other words, the same technology yields diverse results in diverse environments. In short, a super computer is of no use if one masters only a PC, and even that with a limited number of programmes.

Yet it is true that at a given moment technology, which surpasses the present technological capabilities of economy, could pull forward development. If such a technological gap is very large, the absorption of technology into the economic fiber and dissemination effects are prevented. Another modification refers to the so-called infrastructure technologies (telecommunications and information networks on the whole). In the case of infrastructure this leap over the general technological capacities of a society can be greater since its operation depends on a small number of experts. At the same time, such infrastructure is increasingly the necessary condition for technological progress in all other areas today. The modern systems prevailing in the world simply have to be introduced in this area because this is the only way to be included in the modern info-structures.[3] The same applies, as mentioned at the above conference by Dr. Bajt, to military technologies as well as to those from the field of health care. In order to be successful in these areas, one has to apply top technologies and build up personnel solutions accordingly.

Economic optimum is not the same as technological optimum. Therefore it would be more accurate to speak about economic strategy. Technological strategy is important yet still just an integral part of the former. Otherwise there can occur, on the one hand, the elitism of science and experts that exists already, and an "unadjusted and incapable economy" to understand and introduce such proposals, on the other. Technology is the ultimate means with which to facilitate the achievement of selected goals of a country, a company, an individual.

It is crucial for every technological strategy to define who is the technology creator. Institutes and universities are the creators of basic know-how, which must be substantiated later in technology and in new company products. Therefore the only sound basis for the creation of a technological strategy is a close interaction between science and companies. It ought to emerge as a result of creative cooperation between science and economy. Politics should provide conditions in which this connection may strengthen or rather become possible, since until now it has been quite weak in Slovenia. There exist few cases, if any at all, where a society has top technology and science but an underdeveloped economy, or vice versa (at least in the long run). Temporary lagging behind of the former or latter set is normal yet intolerable in the long run.

Truly enough, societies of today are driven technologically. Yet these impulses do not come necessarily from within. The public good of technology, the fantastic swing of information technology, the drop of related costs which has "shrunk" the world into a global village all allow for such technological impulses to come from abroad as well.

Technological transformation is the essential part of economic transformation. The point is not in exchanging the old technology with new but rather in better utilization of the existing technology and in promoting entrepreneurship. Both used to be a greater problem of socialism than was nationalization of physical technology or its character (see Bajt 1993). In short, entrepreneurship is the central point of departure and the basis for any technological development. Only Schumpeter's entrepreneur, who sets innovation as his goal and a means to realize extra profit, will really be compelled to innovate - to innovate something that will yield results on the market.

In short, entrepreneurship is the crucial part of any (technological) development. The role of the state in this relation is to create such conditions that, apart from the market being stimulated, the enterpreneuer will be stimulated additionally, so that his dealings can be more long-term and in better accordance with some general visions of the local environment than if he merely followed market signals. At the same time it is necessary to create a climate in which the prevailing rent-seeking and speculation-driven economy can be surpassed by an economy in which prosperity will be based predominantly on innovative work. Of course, trading, stock exchange and related skills are necessary too, but they should not become major social values as they did to a large extent.[4]

Technological transformation consists not only of promoting innovative skills but also of production and investment capabilities. Today the course of development is not necessarily linear, from promoting innovation skills to investment and production skills; it is even more effective if the sequence adjusts to the conditions of each economy. Thus investment skills (with imported technology) can be developed at first, followed by production skills (while using them) and then innovation skills. To begin with, products manufactured in this way can be adapted and later further developed, or new ones invented. Reverse engineering has become very effective although recent trends in regulation (the Uruguay round) threaten to gradually restrict its range.

Any setting of development and technological strategy must depart from a realistic situation; it must take into account the available factors and limitations and at the same time anticipate changes in the world. It must also try to project the future status of the country/company in the emerging world in general. For a small country, external determinants are extremely important.

3.External Determinants

The coming years are unpredictable regarding both the direction and depth of changes. An imminent end to the present unpredictability and turbulences is not yet in sight. If the world had not changed as much as it did, the situation today would have been similar to that between the two Wars.

The global environment is becoming more and more important. This is even more true in the case of small countries. Many conventional analyses fail because they neglect the structural changes

in the global political economy and also the diversity of particular countries. Today the crucial factors for the behaviour of countries and firms may be sought in the international political economy (Stopford, Strange, 1991: pp. 203-204).

Neomercantilism is advancing.[5] The struggle for market shares is aggravating. We are facing a restructuring race of countries to achieve a better position in the coming century. To this end countries are reaching for every means. Due to all this the risks tend to increase.

The role of economic factors is changing. Human work and knowledge are becoming ever more the decisive factors, whereas material conditions are losing in importance. While the comparative advantages of "inherent" natural wealth used to define the status of a country on the global market, it is now defined by the "brain superstructure": knowledge, skills, including the capacity to forecast changes and to respond to them rapidly. Small countries can try to compensate for their limited resources by relying more on flexible response and accurate anticipation of changes on which they have no influence. Thus the human factor is becoming the corner stone of the competitive struggle between companies and countries.

We are confronted with dematerialization, a decreasing share of material in products and declining significance of direct labour costs. In many technologically advanced production processes (chemistry, electronics) the direct cost of labour amounts to only 10 % of the total cost (Rubner, 1990: 233). Economies of scale (fordism), the foundation of competitive advantages in the past, are losing significance. Economies of scope which can be attained if a set of products is manufactured instead of great quantities of one product and flexibility, on the other hand, are gaining in importance. Product and process technologies are becoming increasingly intertwined. They are driven by ever higher requirements regarding quality and by the necessity for the lowest cost production possible (Miller, 1993: 17). This can be achieved by introducing flexible technology or lean production, i.e., production cleansed of every unnecessary excessive activity (e.g. intermediate quality or stock control, etc.). This requires close relations between the producers and their suppliers. Solutions and not just products are being provided on the world market. In order to maximize incomes the producer has to bring his products (services) closer to the consumer (customization). This adds new impulses to the tendencies that business dealings be globalized even more than they are already.

Informatization of society by way of creating information networks also offers higher competitiveness to non-innovative companies, provided such companies develop the capacity of acquiring, absorbing and utilizing the "extrinsic" information attained in such a way. This is restricted to the network members only, to those who have access to this information. All the rest, the outsiders, are condemned to lag behind. Informatization of society and connecting to world networks is thus the basic condition for the improvement of the country/company's position on the global market. Those who remain outside these networks will be doomed to lag behind.

According to Thurow (1992) there is a competition between two kinds of capitalism: the individualistic Anglo-Saxon type and the group Japanese and German type. The fast ascent of Japan

and Germany in recent decades indicates that the individualistic (American) model has been losing the race. Diverse courses of economic development yielded diverse results. The consumption-oriented American type started to lose its breath. Therefore new responses to the more and more complex challenges of the contemporary world were being sought. This model was overtaken by the production oriented Japanese and German one. However, today the latter two, to put it mildly, are losing impetus. Even more, both of them stand before urgent changes. The common feature of all models is therefore change. Changes have to be applied by the successful as well as those less successful and unsuccessful. Recipes are not the same for everybody though. While Clinton favours industrial policy, the Japanese are looking for a way out in advancing domestic consumption and giving vent to state interventionism. As if both models got into crisis and are now seeking ways forward by way of exploiting the positive sides of the latter model. Is it convergence?

4.Limitations of Small Countries

The position of a small country differs substantially from that of a large one. While a large country can enter the competition to dominate in the seven technologically most propulsive sectors,[6] small countries lack any real possibility since enormous resources are needed for a basic breakthrough in these areas and results are quite questionable. Risks are extremely high. Nevertheless, a small country can compensate for this weakness to a large extent through organizational measures, through correct strategy. More emphasis can be given to realistically achievable accomplishments in process technology and to correct forecasting of future changes. The future will belong to those who are capable of anticipating before all others what is going to happen, what are the basic determinants of competitive advantages in the future world. Long-term orientation is becoming essential. Countries are facing a chess problem. They know it is solvable, yet the winner is only the one who achieves checkmate with the minimum moves.

Limited material potentials set limits on any more ambitious innovation-based development strategy of small countries. This does not mean, of course, that they should abandon their R & D. Far from that. It is true, however, that they are hardly able to raise funds for programmed (breakthrough) achievements in basically new scientific or technological developments. In small economies such breakthroughs are possible more as a side product of the general development of basic research and of a team which "happens to have" exceptional capabilities that may develop in the process. The funds needed today for a technological breakthrough are far beyond the reach of small countries. Even if they were in the position to make such a breakthrough it is questionable whether they could succeed in materializing it on the market, in transforming it into technologies or products throughout the world fast enough to get back the vast resources invested in R & D. At the same time it is necessary to have the strength and capability to make such products and technologies as a new world standard, or else it is not likely to succeed on the market either. If an economy lacks this potential then it is far too great a risk to invest, for instance, several billion dollars in R & D; about such an investment is necessary for any really big

scientific or technological breakthrough (in the case of the most propulsive technologies these funds amount to as much as half of Slovenia's social product).

Nowadays it is not only important to invent a new product or technology but also to return the invested funds in the shortest time possible by trading the product or technology. Apart from the funds for research and development it is also necessary to have means to place the product on the global market (advertising, standardization, protection, etc.). If the producer cannot ensure such means, then his investment in research and development may yield results to somebody else who can. In short, it is necessary to make use of a global network to merchandise a product as broadly as possible.[7] Mort says that "These considerations highlight the obvious, yet sometimes overlooked, point that in revolutionary innovations individual firms must, above all, be right. The costs of mistakes in going too fast or too far with new innovations (too early in the induction or gestation period) can be just as devastating as doing too little too late (beyond the percolation threshold), since unsuccessful attempts at innovations impose the double, simultaneous penalty of wasted resources and lost opportunities. To paraphrase Alexander Pope, 'in business, as fashions ... be not the first by whom the new are tried, nor yet the last to lay the old aside'; an adage Japan has clearly taken to heart. While time may be of the essence - timing is everything." (Mort, 1992: 9). Or in other words: it is timing that counts, the choice of the correct moment means everything.

In spite of all their limitations, due to the profound and rapid changes in the world small countries have certain advantages as well. Small economies can adapt more swiftly than the large ones, they are more flexible. It is on these bases that their strategy has to be built.

5.What strategy to choose and how?

In choosing their development or technological strategies, countries have in principle three possibilities: to choose an ambitious innovation-based strategy or a fully imitation strategy or a combination of innovation and imitation strategies. The external environment, the internal determinants and the smallness of Slovenia tend to fortify the conviction that a mostly innovation based strategy would be too demanding and would involve too much risk. A small economy is hardly capable of raising such funds as are needed for some basic innovation which can be a basis for technological breakthrough. Even if such means could be accumulated, the risk of such investment is so high that large inputs, provided they yielded no return (which is very likely), would threaten the development and even the existence of a small country.

Another restriction is a limited possibility of placing a new product in the shortest time possible throughout the world. A series of examples testifies that companies which had invested huge resources in R & D and invented a new product, had to sell the product to a stronger partner due to their marketing weakness. This way the R & D cost was internalized and a large part of benefit externalized onto the license buyer (see the example of the telefax).

In this light a strategy of quick imitation combined with innovation is more suitable for small countries. However, a less ambitious technological strategy does not limit development scope, and means no marginalization of development ambitions. It is only a realistic appraisal of limited domestic potentials and obstacles the world market is setting. On the contrary, history corroborates that technological leaders of today have gained their position by following. Continental Europe followed Great Britain, the USA followed Europe and Japan started by imitating the USA (Ozawa, 1992: 33).

At the same time, the combination of innovative and imitation orientations facilitates looking for opportunities in the development of those leading the "technological dance" in the world, and a fast imitation, if possible through adapting or cooperating with the technological leaders. We are speaking about the so-called "time based competition[8]" that is a reaction to ever faster technological progress in the world. It was developed as a corporate strategy but can be applied at the macro level as well. Its essence is to shorten the reaction period when introducing new products and technologies to the global market. The firm that is first to follow the innovator has a good opportunity for high earnings. Reverse engineering is one of the methods to achieve this goal. If this is to be accomplished, shrewd fundamental R & D potentials are necessary which would be capable of finding out, at the outset, what really is the new technological opportunity and how to realize such imitation in production with their investment and production resources.

The strategy of creative follower, that is maximizing one's own contribution to the new product or technology, can therefore yield very favourable results in seeking the best way of applying the new technology in local circumstances. The ambitious Korean firms which had set out on the course of innovation based strategy with an ambition to overtake the Japanese have lost steam and have, after some (wasted) years, re-entered the path of rapid though creative imitation as their first priority. Of course, in addition to this orientation they are also investing in R & D to an extent that their economy can bear; this can yield results, but the national economy is not fatally dependent on such investments if they fail to yield results. Too ambitious an innovation strategy can even prove to be fatal for small countries. Vast investment in R & D may yield no results or these may show only in the long run, "after everybody has already passed away". Today even the largest firms are looking for partners to invest in R & D because they alone can afford neither the great inputs nor high risks involved.[9] Major innovations can therefore occur under such a strategy but they are not planned in advance in a predetermined direction involving high investment. Such an orientation facilitates maximal economizing of resources and their directing into where they could yield best results with lower risk involved. Amazing information progress enables fast transfer of new know-how with the character of public benefit, throughout the world. The anticipated new order in this domain, designed by the Uruguay round, will bring somewhat more rules and order. But it will still be possible, in some areas at least, by way of reverse engineering which has become a real art, to reduce successfully the developmental lagging behind the innovators.

Another important dilemma is the choice between an orientation to either product or process technologies. Assuming that all crucial producers on the world market have access to the necessary information on the most propulsive industries on which technological progress in the future is based, the competition in process technologies is becoming relatively more important than that in product technologies. The 21st century will be, according to Thurow, a century of competitive struggle for seven industries. Not everybody can win all of them (Thurow, 1992: 31). Somebody will win the "head to head" duel, others will lose. However, if everybody is oriented into these branches, competitiveness based upon complementarity is about to be abolished; on the other hand, it will be necessary to find advantages before the others within the same industries.

In short, not just what but also how to do is becoming important. This is even more true for the countries/companies that are lagging behind in technology; these can compete with the leaders only if they try to be cheaper in producing a certain product.[10] This was what the Japanese competitive advantages were based upon (ibidem: 49) while in the fifties and sixties the USA was still out of reach for Japan technologically.

Another possibility is to offer to the consumer better design and after-sales services. In short, to make one's products and services more consumer friendly (to customerize them). This means to provide the consumer with not just a product but rather to solve the entire problem due to which he has decided on the purchase.

Similar products can be produced in a different manner, by another process technology, cheaper, in short, and in this way competitive advantages can be acquired even before the innovator.[11] Companies from the seven key fields are being allotted more and more state support in order to gain advantage over the competitiors. While in the past governments would rescue "sinking industries", nowadays they tend more to support the "winners". It is thus not unrealistic to expect "subsidy" wars in spite of everyone swearing by the market. A general growth of the significance of industrial policies verifies such speculations increasingly.

The shift in importance from product to process technology revalues considerably the meaning of the human factor as well. In a case when inventing new products and technologies (product technology) is of prime importance, a narrow stratum of scientist innovators is decisive. On the other hand, when the focus of competitive struggle shifts to process technology, each employee in the process becomes important. Namely, everyone can contribute his share toward a cheaper, more streamlined production. The entire education system has to change accordingly. This is why the crucial measure for strengthening technological potentials is to improve the training system. If in the past the education of the top personnel was important, it is now becoming imperative to raise the general level of education of everybody and to train them for a creative approach to production. According to Thurow, the employee will cease to be but an expense (which he is in the USA) and will have to become a team member (Japan). Education ceases to be just a particular responsibility of an individual (USA) and becomes a collective responsibility of the company (Japan).

In the corporate world, complex as it is today, one can succeed only by joining forces adequately. Therefore a dynamic growth of strategic alliances,[12] "virtual corporations"[13] or "relationship corporations"[14] is not surprising. A parallel with a country can be drawn as well. Small countries, the number of which is going to increase, can achieve certain goals only in cooperation with others. This occurs as a response to globalization tendencies as well as global problems emerging as a consequence of this or as a result of the latest technological achievements.[15]

The challenges of today can no longer be tackled by solving a problem so that matters are returned to their previous condition, before the problem has even emerged. The new approach is to see in the problem an opportunity how to improve things, how to solve the problem so that a new quality is created, a new approach. It is not enough to set things "in the good old place". In short, it is in instant adjusting to new challenges where the responses to old challenges are to be sought.

Transformation is thus no act performed once and for all but rather a continuous process of immediate adjusting and incorporating change into the strategy. It is a pragmatic response to change in the environment (domestic, foreign and international) and a creative complementing and formulating of new strategic responses.

Small countries can substitute their range in innovation strategy by being able to forecast future tendencies and by adapting to them promptly. "Combing the world, taking ideas and technologies wherever they can be found and their global application" is one of the basic messages provided by the success of American minitransnational companies (mini-nationals according to Business Week, September 6, 1993, p. 43).

Finally, the lesson taught by outside trends should be taken into consideration, too: the portfolio theory should be followed whereby says that it is advisable to have "eggs in several baskets". In a world of uncertainty it is only certain that many things will happen during the transition period until the new image of the world is achieved. Strategic liaisons with several partners, each in the domain of his core competitiveness (on this rests the so-called "relationship corporation" concept) seems to be quite applicable in establishing technological links as well. Only a European orientation which would restrict links with others in this light can hinder development, since Europe in many areas lags substantially behind both the USA and Japan.[16] European cooperation, particularly in the domain of high technologies, cannot be a substitute for global cooperation. The research into European transnational high-technology companies has revealed this clearly.[17]

For Slovenia, integration into Europe is doubtless a priority. However, this objective must not screen our view on everything that is going on in the world in technology and economics. In the technological sense there is no dilemma over European or global networking. Any strengthening of technological capacities calls for cooperation with technological leaders, wherever they might be. In terms of technology there are no European products or basic European standards. The vast resources needed for the development of new technologies and products, and the ever shorter time for the return of investment, require global marketing as a basic condition for market suc-

cess. In order for small manufacturers to harvest the fruit of the economies of scale and of production combinations they have to establish links with the large and look for convenient niches in their production. They have to endeavour to materialize skills and know-how acquired in this way as extensively, as globally as possible, otherwise the newly arrived companies may threaten any advantage gained this way and jeopardize the market share acquired with difficulty.

In short, the priority of integration into Europe must not be the only (technological) strategy. Among other things, companies may receive false signals since in many areas European companies are substantially lagging behind the Japanese and Americans. The trading deficit of the European Community in high technologies amounted in 1992 to 40 billion dollars. Since 1980 it has grown three times (Business Week, March 22, 1993). In 1986 Europe's share in the entire world export of high technologies was 18% compared to 33% for Japan and 37% for the USA. Even more alarming is the dynamic of these changes because Europe's rate of growth was negative (-9% in the 1970-1989 period). In the period 1980-1990 the share of Japan in the production of high technologies increased by as much as 59%, whereas that of the USA declined by 11% and the European by as much as 17% (Tyson, 1992: 18-23).

In short, technological strategy and policy as an integral part of developmental vision should rely on an ideal evaluation of the status of Slovenia in the world and on the present stage of development in science and economy. Both parties have to adapt to new circumstances and not just one. At the same time the strategy should envisage the future place that Slovenia wants to take in the global economy. It must be sufficiently pragmatic and should avoid "wishful thinking" and unrealistic expectations. At the same time it has to be ambitious enough to be capable of motivating those who are to implement it. Last but not least, it has to be flexible and capable of responding swiftly to changes in the world. This is likely to be its most vital component.

However, it must be no prescription dictated from above since "government failures" are far worse than "market failures". Discussions to date have not considered this enough. In short, stable and predictable circumstances should be created in which economic and other entities can find their place by themselves. One of such conditions is certainly to incite cooperation between universities and institutes and the economy. In the long run this cooperation can pull the technological cart of development from the "mud". Another, even more important condition is to create an infrastructural information base so that companies and other entities would be able to follow developments in science and technology all over the world. Such a base would create conditions for quick reaction to these changes as the basic components of any strategy. Surely enough it is necessary to avoid any industries and similar solutions, given from "above", since the practice is likely to revoke them all too soon. Political measures politics should be directed into stimulating anything which would help implement the objectives set: the central competitiveness of Slovenia, i.e. its science and economy. The human factor certainly is such a central advantage: perhaps even more potential than existing. The high level of this factor is also a prerequisite for the development of another crucial component - the necessity of swift response and adaptation to trends in the world.

NOTES

1. This paper is part of the project Slovenia in International Relations, financed by the Ministry of Science and technology of the Republic of Slovenia. It is an extended and slightly modified version of the one prepared for the conference Technology and Strategy of Slovenia held in November 1993.

2 .More on the topic of development strategies and challenges of the 21st century in Svetličič 1993 a, b and c.

3. Information communication networks.

4. This is also expressed by the level of interest in science and scientific achievements among the young. The interest of the young in science and scientific achievements is relatively low (26%). A similar survey among older respondents would probably show even a lower percentage. Neither can we be encouraged by the finding that even 31% of secondary school students would emigrate for good and 46% for a longer period but not for good (Mladina 1993, an Faculty of Social Sciences survey carried out on 2,310 secondary and vocational school students).

5. According to Bergsten (1988: 60), more than 40% of the world trade today is managed trade. The GATT regulations are allegedly applied only on 5-7% of global economic activity (Gilpin, 1991: 19).

6. According to Thurow, these are: microelectronics, computers plus software, telecommunication, new materials science industries, biotechnology, civil aviation and robotics plus machine tools.

7. The facsimile technology, for example, was invented back in 1945. The first telecopiers appeared on the market only in 1950. However, their sale rose considerably only in 1984. Ever since it has been increasing by leaps. This shows that it is not just an invention that matters. In the case of many products users are needed as well, or else the induction period from invention to market implementation is quite long. In short, an invention should occur at the very moment when the market is ready to accept the product or technology. In the case of facsimile the basic condition was a corresponding global network of these devices, otherwise they are of no avail. - A similar example is photocopying technology. The first machine appeared in 1949. The first successful product of the kind, the XEROX 914, appeared only in 1959. The leap in selling these devices was related to an innovation in marketing - leasing of devices. Mort says that the introduction of this new marketing method was as important as the invention itself (Mort, 1992: 5-6).

8. See Business Week, August 1992, pp. 42-50.

9. According the study of the success of 11,000 new products conducted by the firm Kuczmarski & Associates indicates that only 56% of all market launched products still remained on the market after five years. Even 46% of cost of developing new products was allocated to such products which never reached the market (Business Week, August 16, 1993, p. 35).

10. The Japanese have started therefore to introduce robots and lean production in the automobile industry.

11. Two cases of winning an advantage in this way, mentioned by Thurow, are the telefax and video. Both were invented by the Americans but it is the Japanese who sell the most: even 99% of fax machines (Mort, 1992: 5).

12. In the eighties, American companies made about 2000 strategic alliances with European firms. More than 55% of commodities they obtain from Japan come from such strategic networks. In 1989, only in biotechnology there were 1213 such linkages in the world (WIR 1992, Table VI.11).

13. This is the latest name for temporary, flexible project business alliances whose aim is to use an opportunity quickly. It is a temporary network of independent companies (suppliers, customers and competitors) without a central organization or hierarchy. They are linked through an information network in which cost, each member's highest potentials and the access to the market are shared. They are based on a high level of confidence (electronic contracts). This way the benefits coming from the muscles of the great (combination of resources, economies of scale) and the flexibility of the small can be obtained. Such a "virtual corporation" operates as a corporation although formally it is not (see Business Week, February 8, 1993, pp. 36-40).

14. In his book The Global Corporation - Obsolete so Soon?, Cyrus Freidheim defines the notion "relationship corporation" as a network of links among large firms from diverse areas and with uniform goals in order to realize certain market opportunities, a project which may be beyond the reach of each individual member (The Economist, February 6-12, 1993, p. 65).

15. It is only possible, for example, to achieve sustainable development if all countries take part because pollution has no boundaries. Modern telecommunication can be introduced by way of global networks only.

16. German productivity in almost all process industry branches lags behind that in the USA. If in the USA it is 100, then in Germany's metal industry it is 77, in chemistry and plastics 75, vehicles 88 and electronic industry 83. Japanese productivity in all these branches surpasses that of the USA by 28 to 13 points (Economist, February 6-12, 1993, p. 67). The German market share in the area of optical equipment declined from 30% in 1975 to 15% in 1989, in telecommunication equipment from 14 to 7%, in machinery from 35 to 22%, in computers from 16 to 7%, etc.

17.. Why? Risks can be mitigated sufficiently only if one cooperates with a technological leader. The risk of market acceptance is lower on the entire world market than on the European market alone. If one wants to succeed on the Japanese market one has to cooperate with Japanese firms. Technological complementarity among various technologic pools stimulates global links as well. Furthermore, it is necessary to set new world technologic standards for new technologies (see Tulder, June 1988, pp. 248-250).

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