Technology Business Strategies

Complex arrangements create major demands on company resources; 'traditional thinking' often inadequate

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While the mere sale of technology has limited organizational consequences, complex arrangements like those which often exist in industrial cooperation make considerable demands on company resources and organization. I will therefore concentrate on these more complex arrangements. A technology-based business strategy might include an integrated solution to the following problem areas:

1. The transfer and control of technology.
2. Joint operations.
3. Counter trade.

The package consists of a number of elements, which come into effect at different times. This makes economic calculations and management difficult. The company must develop efficient management methods in order to make things happen according to plan and maintain a considerable flexibility to handle contingencies (I will elaborate on this aspect in a later section of the paper).

There is, consequently, not only a strategic but also a managerial dimension of technology-based business strategies. The strategic and managerial aspects must be treated in an integrated manner. A viable strategy cannot be developed and implemented without appropriate resources and organization of the operations. However, few companies have developed an integrated or coherent strategy for this type of business. The reasons are that they not only believe profits to be larger by maintaining a "product concept" (i.e. continue to export products or run wholly-owned production) but also have a negative attitude toward joint operations.

Since licensing and turn-key deliveries are often treated as exceptions, they are not integrated in overall company strategies and only limited resources are allocated to this type of operations. Joint operations are contrary to traditional, Western management principles which are based on unilateral control. Hence, company executives are reluctant to become involved in operations that can not be properly integrated with the company's existing management systems.

The company must develop a strategy that enables it to make a profit without losing "too much" control of its own technology. It must make certain that it can maintain its technological lead over the receiver of the technology. Furthermore, it must have access to complementary technologies, for example through cooperation with other companies, when its own technology only represents a part of that for which the buyer asks. These three aspects of the strategic issues (profits, control, and contact network) will be treated separately.

There are, at least, five bases for determining the *profit* potential of a technology-based business strategy:

1. Royalties and profits from deliveries of equipment, engineering services, and joint-venture operations in the receiving country are direct (potential) effects of various levels of involvement in the transfer of technology.

2. The potentials of economies of scale. The company should strive to deliver parts and components to its partners (joint ventures or licensees). Firms which have several partners to whom they deliver the same parts and components might reach considerable economies of scale. It should be possible to develop a similar "internal" specialization as in some multinational companies. In this context, deliveries from the partners should not be ruled out. Furthermore, the sale of a license to competitors in an early stage of the life cycle could lead to a wide acceptance of the company's technology and provide for large-scale production.

3. The potentials of a favored position in the host-country market. In some countries, industrial cooperation can provide for a monopolistic position. In other cases, the goodwill created through industrial cooperation can create beneficial effects to the company. These effects are, of course, difficult to predict, but sometimes cooperative efforts are a prerequisite in order for the company to receive orders.

4. The potential of benefitting from improvements of the technology made by the partners. This is a spider-web strategy. The focal company might pick up new ideas from its partners, and thereby add to its own technological development. The idea is that competent partners are likely to innovate, but that these innovations are different from each other. The only company in the spider web that has access to all improvements is the original licensor.

5. The potential of profits stemming from trading. Buy-back or counter-purchase arrangements might constitute a profit potential in their own right for companies with well-developed trading operations.

The potentials of a technology-based business strategy should then be evaluated against alternative strategies (if there are any). The evaluation might take into account discounted profit-ability, cash flow, ROI, etc. However, the uncertainty in such calculations is usually considerable. Some of the possible effects, such as points 3 and 4 above, are very difficult to predict

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and evaluate in monetary terms. The evaluations must then rely heavily on non-quantifiable factors. Timing is a critical factor in such an analysis. The company must decide at which stage a technology should be sold or transferred to a jointly-owned operation. It must take into account the need for investments, possible profits, etc. at alternative transfer points on the life-cycle curve. The case of the chemical company which is presented below clearly illustrates this point.

Control

In order to realize at least some of these profit potentials, the company must design appropriate *control* mechanisms. It must make certain that it does not lose control of its technology and that it can provide for an efficient operation of a joint venture or the licensed technology. The partners must be tied to the focal company in a long-term prespective. The "simplest way" is, of course, to maintain a technological lead, but this is not always enough. Some companies use license agreements with their own joint-venture companies in order to maintain control of the technology even if the cooperation is broken up. Management contracts is another means that can also be used in order to secure efficient operations in the host country.

There can be numerous strategies designed on the basis of the above described potentials for profit. I will give two examples which illustrate successful technology-based business strategies:

Chemical Co. (a token name) is relatively small in comparison with its big international competitors. It operates in a mature industry in which the technology is fairly well spread. The big competitors (especially the American companies) maintained a "product concept" and continue to export instead of setting up local production.

Chemical Co.'s target markets are NICs where jointly-owned companies are established together with local partners. The partner accounts for the financing and takes a major share (40/60 principle). Chemical Co. strives to find partners (private individuals or companies with complementary operations which are not potential competitors) with a favorable position in the market. In this way, it is possible to create a monopoly. Chemical Co. accounts for the technology. However, it retains control of the core of the operations. This can be accomplished in different ways. Chemical Co. generally assumes managerial responsibility. The local production is based on licenses and concerns, to begin with, relatively simple units in the assortment.

By having local manufacture account for only part of the assortment it can be guaranteed exports from the Swedish operations. The exports have now become so extensive that the joint ventures are the largest customer for the Swedish plants. Without this export, in an industry which is characterized by considerable economies of scale in production,the Swedish operations would not be able to survive.

Chemical Co. itself cannot finance a rapid geographic spread. It has actively searched for cooperation with developing countries, but evidently without giving away very much of the control over the operation. Profits are earned from the partnership, exports from Sweden and license fees, a combination of different motives. Chemical Co. stresses the dynamics of its strategy; gradually, as the joint ventures' competence grows, increasingly advanced production is transferred from Sweden. In order to maintain the export Chemical Co. must increase the number of cooperation countries. The advantages for the developing countries lie in the local production and majority ownership, naturally, but also in the active training done by Chemical Co. The competitors, often cartels, used to dump prices in the initial stages in order to gain a monopoly after which the prices were raised appreciably.

The developing countries' distrust of the large corporations has been of great help to Chemical Co. which, through its evidently well-placed contracts, has been able to build up a reputation for trustworthiness in the host countries. Chemical Co. is, consequently, relatively strong as a result of the developing countries' need of the company's technology as well as their mistrust of many of Chemical Co.'s competitors. The company also claims it has several alternative countries where it is welcome. This gives it a possibility to choose the most suitable countries.

Contact Network

The other example concerns the exploitation of the Canadian oil and gas reserves in the arctic and subarctic areas. It shows that an integrated solution of several functions in one package is often necessary. This requires cooperation between several firms and highlights the *contact network* which a company needs in order to acquire complementary resources.

Japan National Oil Company (JNOC) has concluded a framework agreement with Canadian company Dome Petroleum. JNOC will invest CAD 400 million in Dome's program for developing the oil reserves in the Beaufort Sea. Although, JNOC is not guaranteed deliveries of oil, it has, together with the Ministry of Industry, the big shipyards and shipping companies, established a development organization for arctic shipping.

A second agreement between JNOC and Dome concerns the delivery of LNG to Japan over a 20-year period. In 1981, Dome entered an agreement with Nissho Iwai Inc. and Kawasaki Heavy Industries Ltd. for transferring Japanese shipbuilding technology to Dome. The transfer of technology is coupled to the sale of LNG previously mentioned. Kawasaki will build the first LNG tanker while the other ones will be built at the new shipyard supplied by the Japanese companies.

RESOURCE AND MANAGEMENT ISSUES

In order to successfully implement technology-based business strategies, the company must develop resources and management methods other than those necessary to run the traditional operations.

The transfer of technology requires that the company has adequate training facilities, documentation system, and competent people who are available when needed.

Joint operations generally require larger management resources and often also resources other than those required in unilaterally-controlled operations. There is a risk that too much top management time is consumed and it is difficult to reach and implement decisions. Management resources are also devoted to "a relations care" function, i.e. the company must satisfy and balance the interests of different participating partners.

Consequently, resources and operating costs are essential elements in the implementation of technology-based strategies. I recently made a study on behalf of the Swedish Ministry of Industry of 10 Swedish companies involved in turn-key deliveries, licensing, joint ventures in developing countries. Most of these companies encountered considerable difficulties in making these operations profitable. They were still rooted in their traditional strategies and ways of operating. The following section is a comparison of the traditional and new operations in these companies.

EXTREME CHARACTERISTICS OF THE "TRADITIONAL OPERATIONS" AND "COOPERATION OPERATIONS"

"Traditional operations"	*"Cooperation operations"*
1. "Administrative".	*1. "Entrepreneur directed".*
2. Led by company establment, not seldom bureaucrats.	*2. Led often by "outcasts" or business-oriented people.*
3. Directed toward operative efficiency.	*3. Business constructions and tactical solutions.*
4. "Better" ability to exercise control of operations.	*4. "Less" ability to exercise control of operations.*
5. Certain continuity of operation.	*5. Strong intermittent character of operations*
6. Relatively good possibilities to plan operations.	*6. Difficult to plan operations.*
7. Yearly budget and followups, natural control instruments.	*7. "Longer" time span required for planning and followups.*
8. "Stronger" in competition for internal resources.	*8. "Weaker" in competition for internal resources.*

Table 1

The traditional operations are often built on a certain continuity and stability (see Table 1). Operations are controlled by yearly budgets, plans and certain formal methods for followups. In many cases managerial functions have become "administrative" more than entrepreneur-prone with resulting tendencies toward bureaucracy.

Project sales and industrial cooperation place other demands. Projects have high start-up costs (preliminary studies, tenders, negotiation, etc.) are combined with uncertainty, are intermittent and give limited control possibilities. The traditional system with yearly budgets and criteria for performance evaluation then becomes more or less unsuitable. The focus of success moves from operative efficiency toward creating strategies and tactical arrangements. This does not mean that the operative efficiency is unimportant, but business acumen determines with which prerequisites the current operations will be faced.

Now, if both of the operations entail different demands on the organization, the possibility for internal competition (and conflict) should be considerable. I found that technology unit in "traditional" industrial companies find it difficult to assert themselves in relation to the other units. It is the latter which account for the current income and which administer the main portion of the company's resources.

It is not unusual that technology export is regarded as a marginal activity. A special organization unit which has limited resources is created in order to keep fixed costs at a low level. The unit must then "purchase" capacity internally when needed. Personnel cannot be "ordered", but the technology unit must negotiate with the line units *and* with the specialists in question. The technology unit's planning situation becomes difficult both externally as well as internally. Much time and resources are spent to handle the internal relations.

It happens that the technology unit is regarded as a retreat position, or perhaps more common, is staffed with people who do not fit into the rest of the organization. Often they are entrepreneur-prone people.

Since these people do not belong to the company's establishment, they often find it difficult to assert their units' interest internally. The situation is hardly made better if incoming orders are irregular.

CONCLUSIONS

The structure of demand and the competition in international business require new strategies, resources, control system and organizational designs in companies. It was argued that "traditional" licensing and sale of technology are only elements in those complex arrangements which are becoming increasingly frequent. Technology-based business strategies might include the sale of technology schemes for running joint ventures, buy-back arrangements, etc.

However, it was also argued that, at least Swedish companies have only rarely developed integrated strategies and resources to match them. Technology-based strategies imply considerable deviations from "traditional" thinking in most manufacturing firms.