Internationalization through strategic technology partnering: The role of multinationals in the Netherlands

7. Internationalization through Strategic Technology Partnering: The Role of Multinationals in the Netherlands

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7.1 INTRODUCTION

The globalization of the world economy has received widespread interest from scholars in business as well as in economics (see for example Vernon, 1966; Hirschey and Caves, 1981; Pearce, 1989: Bartlett, Doz and Hedlund, 1990: Dunning, 1988 and in this volume). Globalization is often described as a process that will eventually lead to a single global world market in which companies have become 'footloose' with no particular commitment to any specific country. In such a global market, large companies would have a global presence in virtually all countries (Reich, 1991).[1] The globalization tendencies which are widely portrayed and heralded in the literature have, however, been questioned by others (see for example Porter, 1986, 1990; Patel and Pavitt, 1991; Hu, 1992).

In the present contribution we place our research in the context of the discussion above. We will first try to identify some major trends in the internationalization of corporate technological activity as found in the output of research and development. In addition, we will also pay attention to international strategic technology partnering that plays an important role in the international strategies of major companies. For both topics, the internationalization of research and development and strategic technology partnering, specific attention will be paid to the role played by multinational companies in one small open economy, that is the Netherlands.

7.1.1 The Internationalization of Research and Development

As John Dunning has explained in several publications (see for example Dunning, 1988, 1993, and in this volume) companies are increasingly engaged in foreign production activities. Subsequent research has established that the internationalization of R&D follows the establishment of production

activities with a certain time lag (Pearce, 1989; Cantwell, 1991). In the literature on multinational enterprises, several advantages of an international dispersed network of R&D facilities have been reported (Granstrand, Hakanson and Sjolander, 1992; Miller, 1994; Pearce and Singh, 1992). The traditional rationale for the creation of foreign R&D facilities was to adapt products to the local market or to satisfy host country government regulations. By creating local R&D facilities firms can be in close contact with their customers and major local suppliers. This enables them to respond quickly to differences in demand among the various countries and allows them to interact with their major local suppliers. Sometimes local R&D is a necessity to gain government contracts, for example; in telecommunications and military equipment or to facilitate local clinical testing, for instance, in pharmaceuticals (Granstrand, Hakanson and Sjolander, 1992). However, there are also a number of factors that favor the geographical centralization of R&D facilities in the home country. The main reason to centralize R&D within the home country is the existence of economies of scale and scope in R&D. If economies of scale and scope exist, then one large R&D facility is often more efficient than several smaller facilities. The establishment of centralized R&D facilities near the major production centers can also be used to improve the interaction between the production, marketing and R&D departments. It has also been noted that centralization of R&D aids the protection of firm-specific technologies (Rugman, 1981). In the case of centralized R&D there seems to be less danger of knowledge 'leaking' to competitors (Granstrand, Hakanson and Sjolander, 1992).

A number of recent studies suggest that multinational companies have gradually increased their foreign R&D activities. An increase of overseas R&D has been reported by, among others, Lee and Reid (1991), Reich (1991), Graves (1991) and Miller (1994). These studies suggest that foreign R&D has grown more rapidly than domestic R&D expenditures. Others have reported a strong increase in the number of overseas R&D facilities of major multinational companies (Peters, 1992; Pearce and Singh, 1992). In addition to innovation input statistics, measures of innovation output have also been subject to a number of studies (Cantwell and Hodson, 1991; Patel and Pavitt, 1991). Patel and Pavitt (1991) made use of US patent statistics to analyze international patenting activities of large multinational corporations. In their study they distinguished between patents obtained in the US by 'national' companies in each country and patents obtained by foreign subsidiaries of those same companies. Their study confirmed that although foreign subsidiaries of multinational companies do indeed contribute significantly to world innovative activities, this contribution was less than 10 percent of world patenting during the first half of the 1980s.[2] Other authors (Cantwell and Hodson, 1991) found somewhat higher shares of international patenting.

They estimate the share of US patents attributable to research in foreign locations for the world's largest firms during the first half of the 1980s at about 10 percent. These differences are partly due to the fact that whereas Patel and Pavitt include small and medium-sized companies, universities and government laboratories, Cantwell and Hodson include only the largest companies. However, the latter research indicates also 'that the world's largest firms witnessed a mild trend towards the internationalization of technological activity over the 1969-1986 period' (Cantwell and Hodson, 1991, p. 137).

In the next section we will try to assess the importance of foreign R&D for a small open economy such as the Netherlands. In that context we will look in particular at patents as a measure of R&D output.

7.1.2 The Role of Foreign R&D for Companies in a Small Open Economy

The European Patent Office statistics show that about 35 percent of all the patent applications by Dutch firms are a result of research outside the Netherlands (see Table 7.1).

Table 7.1 Patent application from research outside the home country as a percentage of total patent applications, 1991

Country	Percentage	Country	Percentage
The Netherlands	35	Greece	6
United Kingdom	15	Spain	5
Belgium	12	Germany	5
Sweden	12	Switzerland	4
Austria	9	Finland	4
Norway	8	Italy	2
Denmark	6	Ireland	1
France	6	Japan	1
USA	6	Portugal	0

Source: MERIT, based on EPO data.

In terms of patents obtained outside the home country, the Netherlands appear to lead the internationalization process of R&D. There are two major factors that account for this high percentage of foreign R&D in the Netherlands (Duysters and Verspagen, 1994):

- The Dutch economy is dominated by a relatively small group of large multinational corporations. The five leading multinational firms in the Netherlands account for more than half of all the corporate R&D expenses.
- The Netherlands is a relatively small country. In such a small country it is impossible to find all the necessary technological and other resources that are necessary to compete in today's global marketplace (see also Dunning in this volume).

Further analysis shows that a considerable part of foreign research of Dutch companies takes place in Germany and the United Kingdom and to a somewhat lesser extent in the US and France (see Table 7.2). These countries are also the major trading partners of the Netherlands.

Table 7.2 Patent applications of Dutch companies, ranked according to country of innovation, 1979-1993

Country	Percentage
The Netherlands	67.0
Germany	10.6
United Kingdom	10.4
USA	6.2
France	5.3
Switzerland	1.2
Japan	0.5

Source: MERIT, based on EPO data.

7.2 INTERNATIONALIZATION THROUGH STRATEGIC TECHNOLOGY PARTNERING

In the literature on internationalization it is sometimes suggested that strategic alliances are essential to international corporate strategies (Ohmae, 1990; de Woot, 1990: OECD, 1992a). Before the 1980s, co-operative agreements (usually joint ventures) were typically undertaken between somewhat smaller companies. During the 1980s large multinational Enterprises (MNEs) came to play a role in the establishment of strategic alliances (Hladik, 1988). Traditionally most of these alliances were undertaken in order to gain access to foreign markets or to bypass government regulations (Contractor and Lorange, 1988; Hamel, Doz and

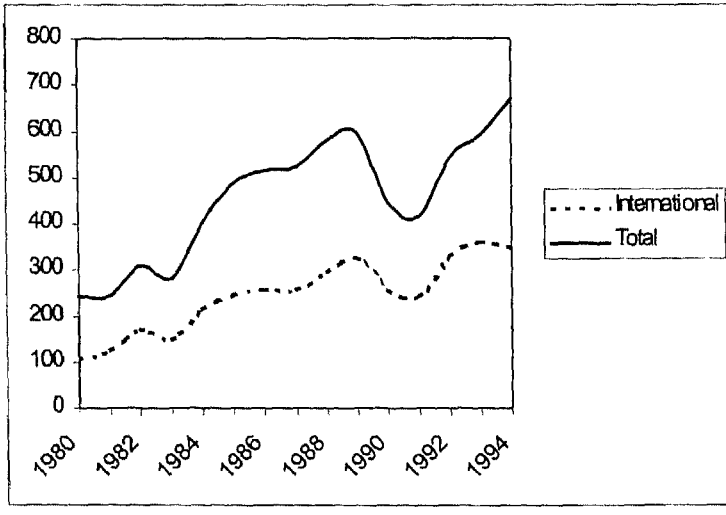
Prahalad, 1986; Haklisch, 1989; Porter and Fuller, 1986). Today we observe an increasing number of multinational corporations, more or less comparable in size, that link up with each other. The scope of these alliances is usually global and the modes of co-operation can take numerous forms: for example consortia, cross-licensing agreements, joint ventures, research partnerships, franchising and so on. Whereas co-operative agreements used to be undertaken on the basis of short-term objectives, today firms are increasingly recognizing the strategic importance of these agreements (Harrigan, 1985b; Porter and Fuller, 1986; Contractor and Lorange, 1988). In today's global markets, where technological progress is extremely rapid, boundary-spanning strategic technology alliances have become an important factor for the overall competitive position of a company. Before the mid-1970s there appeared to be an inverse relationship between R&D intensity and co-operative alliances (Stopford and Wells, 1972; Friedman, Berg and Duncan, 1979; Haklisch, 1989). Today, high-technology sectors account for the majority of all newly established alliances (Fusfeld and Haklisch, 1985; Osborn and Baughn, 1990; Mytelka, 1991; Hagedoorn 1993). Changes in the relative importance of strategic technology alliances for high technology sectors are above all due to fundamental shifts in the structure of the global environment and in the process of technological change (Haklisch 1989). Fierce competition, the homogenization of markets and ongoing Globalization tendencies account for most of the structural changes, whereas rapid growing capital and R&D costs, the ever increasing complexity of products and a significant increase in the speed of technological developments are important drivers from a technological point of view (Haklisch, 1989). The rapidly changing technological and competitive settings induced firms to search for new ways to increase their flexibility. In the late 1970s and early 1980s a number of companies started to trade their traditional practices like mergers and foreign direct investments for various types of technology sharing agreements. These new forms of agreements gave firms a previously unknown degree of flexibility in terms of the acquisition of technology and foreign market entry. (Vonortas, 1989).

The data presented in this chapter are based on the MERIT-CATI database (see also Appendix 1). The concept 'inter-firm co-operation' is used to refer to those co-operative agreements between partners that are not coordinated through (majority) ownership. Although co-operative agreements can take numerous forms such as marketing, production and research agreements we will limit our analysis to technology driven agreements. Before 1975, this type of agreement was virtually unknown (Hladik, 1985). In the 1980s however, several authors started to report a strong and steady increase in the number of strategic technology alliances (Hagedoorn and Schakenraad, 1990; Hergert and Morris, 1988). In order to

safeguard the strategic element in our sample, we will study only those alliances that are assumed to affect the long-term product market positioning of at least one partner. Because alliances between public agencies or academic institutions and private companies are often undertaken for different reasons than the alliances between two or more private companies (see for example Haklisch, 1989), we will restrict our attention to those alliances that are established between private companies. For the same reason, we do not pay attention to government initiated or EU-wide R&D cost-sharing programs such as ESPRIT, EUREKA or JESSI.

In order to assess the importance and magnitude of (international) strategic alliance activity we calculated the number of newly established strategic technology alliances as they appear in our CATI database. Figure 7.1 shows that the number of newly established (international) strategic technology alliances increased rapidly during the 1980s.

Figure 7.1 New strategic technology alliances (1980-1994)



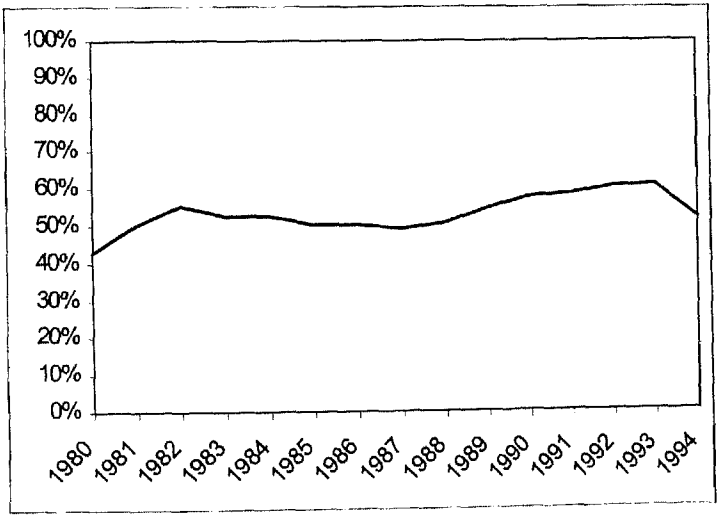
Previous work has shown that during the early 1970s co-operative activity remained at a rather modest level in the information technology industry. During the second half of the 1970s, as companies were slowly becoming more aware of the advantages associated with the use of strategic alliances, the number of newly established alliances started to increase gradually.[3] It was not, however, until the late 1970s that the number of alliances really took off. Apart from a short period of stabilization in the mid-1980s growth persisted until the end of the decade. The overall increase in alliance activity

during the 1980s coincides with a period of worldwide structural and technological turbulence in many key industry sectors. During this period both production and R&D costs have been rising rapidly whereas ongoing internationalization tendencies have increased the 'global' character of the industry.

All these factors seem to have increased the need to establish strategic alliances. At the end of the decade, the growth rate in the number of newly established alliances seemed to level off. An explanation for this slower growth rate can be found in difficulties associated with the management and control of strategic alliances. As companies become more aware of the risks and dangers of co-operation, they tend to become more careful in closing strategic alliances as their most preferred contractual form (Hagedoorn, 1993). In the early 1990s, we again find a growth in the number of newly established alliances. Companies started to use newly developed management techniques that allowed them to cope with the difficulties associated with strategic partnering, whereas increased competitive pressures and ever rising R&D costs in combination with shrinking life cycles increased the need for technology/cost sharing even more.

An indicator of the possible internationalization of strategic technology partnering is found in a relative internationalization index, which we calculated by taking the percentage of international alliances as a percentage of all newly established alliances (see Figure 7.2).

Figure 7.2 Relative share of international technology alliances in newly established alliances (1980-1994)



International strategic technology alliances have always accounted for a relatively high percentage of all strategic technology alliances. In the eighties, they represented about 50 percent of all strategic technology alliances. In the early 1990s, their number increased to about 60 percent. In 1994, however, the percentage decreased again to slightly more than 50 percent.

Table 7.3 Distribution of strategic technology alliances according to home country of partner(s), 1980-1994

MNE	Total	Netherlands	USA	Japan	Germany	France	UK	Switzerland
Shell	104	16	25	4	6	2	9	2
		15.4%	24%	3.8%	5.8%	1.9%	8.7%	1.9%
Philips	260	19	59	30	31	24	11	4
		7.3%	22.7%	11.5%	11.9%	9.2%	4.2%	1.5%
Unilever	23	4	5	2	0	0	6	1
		17.4%	21.7%	8.7%	0%	0%	26.1%	4.3%
DSM	43	5	4	7	1	2	2	1
		11.6%	9.3%	16.3%	2.3%	4.7%	4.7%	2.3%
AKZO	47	5	14	6	3	3	1	0
		10.6%	29.8%	12.8%	6.4%	6.4%	2.1%	0%
Total	477	49	107	49	41	31	29	8
		10.3%	22.4%	10.3%	8.6%	6.5%	6.1%	1.7%

Source: MERIT-CATI database.

Table 7.3 illustrates the distribution of strategic technology partnerships of the five leading Dutch multinationals (Shell, Philips, Unilever, DSM and AKZO) in the period 1980-1994. Only 10.3 percent of all alliances were undertaken with a domestic (Dutch) partner. This confirms the assumption that strategic alliances are a very important part of the internationalization strategy of Dutch multinationals. Philips stands out as the most outward-oriented organization in terms of its strategic technology alliances. If we compare Table 7.3 with the findings in Table 7.2 we find large similarities in terms of the countries in which Dutch firms try to find the required technological knowledge. However, Japanese firms seem to play a more important role in international strategic technology alliances with Dutch multinationals than as a home base for foreign laboratories. This illustrates the position of Japan as a knowledge-intensive, but difficult to penetrate, market (at least without a Japanese partner). US firms also seem to play a more important role in the strategic alliances of Dutch multinationals. In other words, proximity seems to play a more important role in the establishment of foreign laboratories than in the case of strategic technology alliances.

7.3 CONCLUSIONS

In this chapter we analyzed patterns of internationalization of corporate technological activity. The empirical analysis shows that only a relatively small degree of corporate technological activity takes place abroad. A noticeable exception is the position of companies from the Netherlands. The Netherlands seem to have, by far, the highest amount of international R&D, measured in terms of the percentage of patents that result from foreign R&D. This leading position in the internationalization process of R&D is due to two major factors: (1) the dominance of a relatively small group of large multinational corporations and (2) the size of the Dutch economy.

Whereas foreign R&D facilities play a relatively minor role in the R&D strategies of international firms (with the exception of the Netherlands), strategic alliances seem to play a much more important role in the internationalization strategies of companies worldwide. During the 1980s and early 1990s we find that between 50 and 60 percent of all strategic alliances were undertaken by partners from different home countries. The increase in the absolute number of international strategic technology alliances, however, does not indicate an increasing trend towards internationalization. The growth in the number of international strategic technology alliances was met by similar growth in the number of newly established domestic strategic technology alliances. Strategic technology partnering has therefore not necessarily become more internationalized, in contrast to the case of foreign R&D by Dutch multinationals which seem to be very internationally oriented in terms of their strategic technology partnerships. Only about 10 percent of all the alliances of Dutch multinationals are undertaken with a domestic partner.

These findings indicate that firms in the Netherlands are particularly outward-oriented. A certain degree of internationalization of R&D can be useful for an open economy such as the Netherlands and the fact that this occurs is certainly not surprising given the small scale of the Dutch economy. However, such a strong outward orientation might lead to a situation whereby domestic companies cannot benefit from the spillover effects of the R&D activities of large multinationals that undertake a disproportionate share of their R&D in other countries. The Dutch government could try to encourage more domestic R&D by actively creating a strong technological infrastructure, for example by government stimulation of R&D and by providing high quality education to engineering students. This would not only invite Dutch multinational companies to keep some of their R&D facilities in a well-developed technological infrastructure, it would also invite other companies to set up additional R&D activities in the Netherlands.

APPENDIX 1: THE CO-OPERATIVE AGREEMENTS AND TECHNOLOGY INDICATORS (CATI) INFORMATION SYSTEM

The CATI data bank is a relational database that contains separate data files that can be linked to each other and provides (dis)aggregated and combined information from several files. The CATI database contains three major entities. The first entity includes information on over 14,000 co-operative agreements involving some 6500 different parent companies. The data bank contains information on each agreement and some information on companies participating in these agreements. We define co-operative agreements as common interests between independent (industrial) partners which are not connected through (majority) ownership. In the CATI database only those inter-firm agreements are being collected, that contain some arrangements for transferring technology or joint research. Joint research pacts, second-sourcing and licensing agreements are clear-cut examples. We also collect information on joint ventures in which new technology is received from at least one of the partners, or joint ventures having some R&D program. Mere production or marketing joint ventures are excluded. In other words, our analysis is primarily related to technology co-operation. We are discussing those forms of co-operation and agreements for which a combined innovative activity or an exchange of technology is at least part of the agreement. Consequently, partnerships are omitted that regulate no more than the sharing of production facilities, the setting of standards, collusive behavior in price-setting and raising entry barriers - although all of these may be side effects of inter-firm co-operation as we define it.

We regard as a relevant input of information for each alliance the number of companies involved; names of companies (or important subsidiaries); year of establishment, time-horizon, duration and year of dissolution; capital investment and involvement of banks and research institutes or universities; field(s) of technology;[4] modes of co-operation;[5] and some comment or available information about progress. Depending on the very form of co-operation we collect information on the operational context; the name of the agreement or project; equity sharing; the direction of capital or technology flows; the degree of participation in case of minority holdings; some information about motives underlying the alliance; the character of co-operation, such as basic research, applied research, or product development possibly associated with production and/or marketing arrangements. In some cases we also indicate who has benefited most.

The second major entity is the individual subsidiary or parent company involved in one (registered) alliance at least. In the first place we assess the company's co-operative strategy by adding its alliances and computing its

network centrality. Second, we ascertain its nationality, its possible (majority) owner in case this is an industrial firm. Changes in (majority) ownership in the 1980s were also registered. Next, we determine the main branch in which it is operating and classify its number of employees. In addition, for three separate subsets of firms time-series for employment, turnover, net income, R&D expenditures and numbers of assigned US patents have been stored. The first subset is based on the *Business Week* R&D scoreboard, the second on Fortune's International 500 and the third group was retrieved from the US Department of Commerce's patent tapes. From the *Business Week* R&D Scoreboard we took R&D expenditure, net income, sales and number of employees in 1980. Some 750 companies were filed; during the next years this number gradually increased to 900 companies in 1988, which were spread among 40 industry groups. The *Fortune International 500* of the largest corporations outside the US provides amongst others information about sales (upon which the rankings are based), net income and number of employees.

A third entity was recently added in order to perform more in-depth research in the information technology field. For this purpose, detailed information on leading companies in the three major segments of the information technology industry was included in the database. These major segments comprise the data processing, telecommunication and microelectronics industry. For all these industries, information on the direction of technology flows and on technology to market ratios of major players in these industries were processed from the CATI alliance database and stored in a separate entity. Information on technology flows is used to measure the degree to which the strategic partnerships of companies diffuse technology to their partners or absorb technology from them. Technology-to-market ratios are created in order to measure whether a company's alliances are primarily focused on research or used for market-entry purposes. This information was subsequently complemented by information technology diversification patterns of the same firms which we were able to obtain from Elsevier's *World Electronics Company File*. In order to measure the research activities of these firms, detailed patenting behavior information was processed from the US Department of Commerce patent tapes. In addition we included complementary data from various sources. The Gartner Group provided us with a comprehensive data set which comprised information on corporate sales, data processing sales, R&D expenditures and operating income of the 100 largest worldwide data processing companies. Data on the telecommunications industry was gathered from various sources. Publications of telecommunications sales of major telecommunications firms were found in specialized journals and newspapers, books and annual reports. Sources include DATA, DATAQUEST and BIPE. R&D

expenditures were already available from the CATI database, or taken from annual reports or Elsevier's *World Electronics Company File.* Microelectronics sales data were also obtained from various specialized journals and from newspapers. All journals and newspapers we used for our sample made use of Dataquest data. Once again R&D expenditure data as well as total sales data were obtained from the CATI database as well as from annual reports and Elsevier's *World Electronics Company File.*

NOTES

1. The foreign subsidiaries of these multinational enterprises (MNEs) would then be linked through major information networks that enable the corporate headquarters to communicate with their subsidiaries and to maintain control at relatively low cost.
2. Only in the case of Dutch and Swiss companies does the number of patents from subsidiaries rise to a very high proportion. This is mainly due to the existence of a few very large Dutch and Swiss companies that have strong manufacturing and R&D asets outside their small domestic base.
3. This so-called 'initiation effect' is dealt with more extensively in Hagedoorn (1993).
4. The most important fields in terms of frequency are information technology (computers, industrial automation, telecommunication, software, microelectronics), biotechnology (with fields such as pharmaceuticals and agro-biotechnology), new materials technology, chemicals, automotive, defense, consumer electronics, heavy electrical equipment, food and beverages, and so on. All fields have important subfields.
5. As principal modes of co-operation we regard equity joint ventures, joint R&D projects, technology exchange agreements, minority and cross-holdings, particular customer-supplier relations, one-directional technology flows. Each mode of co-operation has a number of particular categories.

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