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ABSTRACT

The strategic role of plants is an important decision variable in the design of international plant networks. The framework introduced by Ferdows in the 1990s offers an interesting typology, classifying plants according to their strategic role. Empirical research testing the framework showed its value as a tool for the analysis and assessment of the role of plants in such networks. This paper reports on a follow-up of this empirical study, ten years later. It shows that the typology has predictive value for the future perspectives of the plant. While most of the lead plants have survived, several off-shore and source plants, and some of the server and contributor plants have disappeared from the network. As such, the framework can be useful for plant managers whose objective is to safeguard the future of their plant, as well as for executives in headquarters, who design and redesign plant networks for future competitiveness.

Keywords: international manufacturing, strategic role, survival

INTRODUCTION

In the design of an international manufacturing network, executives decide on the location of their plants, the focus and specialization of their plants, the capacity of their plants, as well as the role the plants will play in the network. They need to balance carefully a top-down and a bottom-up perspective. On the one hand, they need to decide on the strategic priorities of the network, and thus they need to set goals and objectives for each of the plants. On the other hand, they need to understand the dynamic capabilities of each of the plants, and will try to exploit these capabilities optimally.

The architecture of plant networks will evolve over time, in response to changes in the economical and social environment and to the moves of competitors. Plant capabilities may grow or may get lost. The role of the plants, therefore, will evolve over time. This evolution in the role of the plants may be driven by the enthusiasm of plant managers who take initiatives and who build on their plant's competencies. Or it may be driven by top-down decisions of headquarters, based on benchmarking of the plants in the network. For example, as markets grow or decline, or as labor costs increase, a plant in a certain region may loose its location advantage in the network, and may have to down-size or even close.

This paper reports on a longitudinal research project, carried out in eight multinational companies over the past ten years. They all are manufacturing companies, with headquarters in Western Europe, and with plants in several regions in the world.

We had studied these eight multinationals in 1995-1996. We revisited them in 2005-2006, to study how these companies had changed their manufacturing network. In both research rounds, our goal has been to identify the strategic role of each of the plants in the network they were part of. Our main hypothesis was that the current strategic role of the plant in the network has predictive value for the future role of the plant. In this paper we explain and test this hypothesis, and we draw some lessons for practitioners.

THEORETICAL FRAMEWORK

The "strategic role of the plant" has been conceptualized first through the typology of plants developed by Ferdows (Ferdows, 1989, Ferdows, 1997). Ferdows' framework describes six possible types of factories, based on two dimensions (see Figure 1):

- The *primary advantage for exploiting the plant*, that is, market proximity, availability of low-cost input factors, and availability of skills or know-how.
- The *degree of contribution of the plant to the company's strategy,* ranging from "low" for factories that have as their sole role to get products produced, to "high" for factories that do not only produce products, but are also important developers and providers of know-how for the other plants in the network. Another way of defining this second dimension is by referring to the plant's competence, which may include, next to production, also process technical maintenance, procurement, local logistics, production planning, product and process development and improvement, development of suppliers, the supply of global markets, and a global hub role for product and process knowledge. (Ferdows, 1997) In what follows, we will label this vertical axis as the "*level of strategic role*" of the plant.

Insert Figure 1 About Here

Ferdows introduced the framework as a typology that helps to describe and understand the position of plants in the manufacturing network. In our earlier work, we have tested the framework on 8 companies with 59 plants in total and we concluded that the framework proved indeed to be useful for the description and assessment of plant networks (Vereecke and Van Dierdonck, 2002).

Ferdows also insisted on the dynamics in this model. He described some natural changes in the strategic role of a plant, as is also suggested in the graphical representation of the framework (see Figure 1). Our recent research now offers empirical data that allows us to test this evolution, over a period of ten years.

RESEARCH METHODOLOGY

Ten years ago (1995-1996) we carried out exploratory case research in eight multinational companies (Vereecke et al, 2006). Data were gathered at two levels of analysis: the plant and the company.

- Interviews were conducted with the general manager and with manufacturing managers at headquarters, using a structured questionnaire with closed and open-ended questions as a guide through the interviews.
- A second questionnaire was sent to the plant managers and/or the manufacturing managers in the distinct production plants.

In the second round of the research carried out in 2005-2006, with the support of “Flanders District of Creativity”, interviews have been conducted with one or two managers in the headquarters of each of the companies. We have again used a structured questionnaire as the basis of the interviews. They were explained our original model and were asked to rate the still existing and new plants on their strategic role.

We have measured the level of the strategic role of the plant on a 9-point Likert scale, and have asked our respondents to score all plants in the network on this scale. The following descriptions have been attached to the scores:

1 The main goal of the plant is "to get the products produced". Managerial investment in the plant is focused on running the plant efficiently.
3 The plant has sufficient internal capabilities to develop and improve its own components, products and production processes
5 The plant is a focal point in the company for the development of specific important components, products or production processes
7 The plant develops and contributes know-how for the company
9 The plant is a "center of excellence", and serves as a partner of headquarters in building strategic capabilities in the manufacturing function

We have asked our respondents to indicate on a list of potential reasons for exploiting plants the three main reasons for each of the plants. In the 1995-1996 study, we had asked them to indicate the primary reasons for establishing the plant initially, as well as the primary advantage for (still) having the plant at that time (that is in 1995-1996). In the 2005-2006 study we have asked them to indicate the primary advantage for having the plant to date (that is in 2005-2006). This allows us to compare over time the advantages plant locations offer to the network as a whole.

RESEARCH RESULTS

A detailed discussion of the conclusions from the 1995-1996 study can be found in some of our earlier publications (Vereecke and De Meyer, 2006, Vereecke and Van Dierdonck, 2002, Vereecke et al., 2006). In this paper, we summarize the main conclusions that matter in the comparison of the strategic role of the plant today (2005-2006) and 10 years ago (1995-1996).

The eight multinationals studied in 1995-1996 consisted of 59 plants: 42 plants were located in Europe, spread over 14 different countries. The other 17 plants were spread over 10 different countries in East Asia and the Middle East, the USA and Canada, South Africa and Australia. We thus had a truly international sample.

One of the conclusions from the 1995-1996 study was that our empirical data supported Ferdows' model, as can be seen in Figure 2. We concluded that the main advantage of exploiting the plants fell into the three categories put forward by Ferdows: proximity to inputs (mainly low-cost labor), proximity to the market, and access to know-how and skills. We did however observe a number of plants with market proximity as their main advantage, and yet a high level of strategic role. Such plants were not described in Ferdows' model. It showed that the availability of skills and know-how were not the only, and not even the main driver for the existence of centers of excellence. Alternatively, we observed a few plants which had the availability of skills and know-how as their primary advantage, but weren't playing the role of lead plants. They also weren't recognized by Ferdows in his framework.

Insert Figure 2 About Here

As you can observe in Figure 3 the dominant factor explaining plant location was the market proximity. We concluded that, even though offshoring for cost reductions was important, our multinationals still had the market as their main driver for their internationalization strategy.

Insert Figure 3 About Here

By 2005-2006, the 8 multinationals had 83 plants: 42 plants were located in Europe, spread over 13 different countries. The other 41 plants were spread over 18 different countries in East Asia and the Middle East, the USA and Canada, Africa and Australia. A first striking change is the increased globalization over the past 10 years. In 1995-1996 the plant networks of the 8 multinationals were predominantly European with a few sites in other continents. Today they have become truly global.

Thirty-one percent of the plants which were in the plant network in 1995-1996 are not there anymore today. Most of these plants have been closed. A few plants have been taken over by other companies. Some others were very tight partners, with whom the partnership has been stopped. On the other hand, 42 new plants have been introduced to the plant networks either through mergers and acquisitions, or as greenfield plants (Figure 4).

Insert Figure 4 About Here

In Figure 5 we positioned these 82 plants in Ferdows' framework. Like in 1995-1996, we find some plants with a high level of strategic role that yet have market proximity as their main location advantage. These plants seem to act as a center of excellence in the network, even though skills and know-how is not their primary location advantage. We also observe two plants which have input factors as their main advantage, and yet act as center of excellence. Ferdows' framework falls short of a label for such plants.

It is also interesting to observe that, as in 1995-1996, some plants seem to have lost their location advantage at all.

Insert Figure 5 About Here

As you can see in Figure 6, the market is still the main driving factor behind the international plant network of the 8 manufacturing multinationals. 62% of the factories (compared to 64% in 1995-1996) have market proximity as the main location advantage. The number of factories that have labor cost as their main advantage has gone down proportionally, from 15% to about 10%. Obviously, we won't deny that delocalization has taken place. Yet, we have to conclude that cost is not the only, not even the main factor in the internationalization strategy of our multinationals.

Insert Figure 6 About Here

Table 1 and Table 2 give some details on the location advantage of the plants which have disappeared from the networks, the ones that have survived, and the ones that have joined the networks over the past ten years.

Insert Table 1 About Here

Table 1 shows that proportionally less plants which have the market or skills and know-how as their main location advantage have disappeared; while proportionally more plants which had labor cost as their main advantage have disappeared. It will be no surprise that 3 of the 4 plants for which no location advantage could be mentioned in 1995-1996 have also disappeared.

This leads us to the conclusion that skills, know-how and market proximity are stable location advantages, while labor cost, and (obviously) the lack of any major advantage is a less stable condition for a plant to operate in.

Insert Table 2 About Here

In Table 2 you can see that about half of the plants in today's network have been added to the network over the past 10 years. As stated already earlier, market proximity has been a major driver for adding plants to the network. An intriguing observation is that, again today, 3 of the plants that have survived are now reported to be in a location that is not adding value to the network.

In *Table 3* you can see the average level of the strategic role played by the plants, as rated in 1995-1996, and as rated in 2005-2006 (on a 1-to-9 Likert scale). It again distinguishes between the plants that have left the network, the ones that have survived, and the ones that have joined the network over the past ten years.

Insert Table 3 About Here

The plants which have disappeared from the network, on average, were playing a lower level of strategic role than the ones that have survived. Also, it is striking that the plants which have entered the networks play a lower level of strategic role than the plants which have been in the network for more than ten years.

Figure 7 repeats the figure on the strategic role of the plants, but now indicates which of the plants that were in the network in 1995-1996 have survived and which have disappeared from the network.

Insert Figure 7 About Here

In this figure you can see that almost all of the offshore and source plants have left the networks. Also, some of the server and contributor plants are gone. And to no surprise, the three plants with low level of strategic role, and for which the location advantage had disappeared, are not there anymore.

This suggests that source and offshore plants have an uncertain future, whereas the role of the lead plant seems to be provide guaranteed future.

We conclude from the previous discussion that the *strategic role* has a predictive value for the future of the plant.

CONCLUSION

Over the past ten years, most of the eight multinationals have strongly internationalized their manufacturing network. Through mergers, acquisitions and greenfield plants, the networks have become truly global. While some of the plants abroad have been established to tap into low cost labor, most of the plants abroad have been established to tap into new markets. The market was and still is the main driving factor behind the international plant network of the 8 manufacturing multinationals. This may be somewhat counterintuitive if one would rely on the impressions created by the popular press.

The exploitation of plants in distant markets does not only take place for logistical reasons. We also see that the proximity of the market is considered as a source of know-how for some companies; some of these plants play the role of centers of excellence in the network.

Some location advantages seem to be more stable than others: The availability of skills, the availability of know-how and the market proximity are stable location advantages, while the availability of low-cost labor is less stable. Obviously, plants which are reported to have lost their location advantages face a less secure future.

This conclusion holds for all levels of strategic role. That is for plants which are in the network for production output only, as well as for plants that develop know-how and strategic capabilities. Or, using Ferdows' terminology, almost all of the offshore and source plants have left the networks; also some of the server and contributor plants are gone. The role of the lead plant seems to provide a guaranteed future.

The conclusions for practitioners differ depending on the perspective taken: the *plant manager*, running his or her plant and building the future role of the plant, or the *manager in headquarters*, overlooking the global manufacturing network of plants.

The plant manager will remember from this study that the growth and future of his or her plant depends on the location advantage of the plant and on the role it plays today in relation to the other plants in the network.

Each plant is to some extent “in competition” with the other plants in the network. In order to safeguard the future of the plant, the plant manager may want to tap into location advantages which were not prevalent at the start, but which allow the plant to grow in the future. For example, plants which are exploited for reasons of low labor cost today, may want to build on skills or market growth for the future. Also, as know-how develops in the plant, the plant manager could offer this know-how to the other plants in the network. The lead plant, which serves as a center of expertise for other plants, will play a crucial role in the overall innovation strategy of the network, and therefore have a more guaranteed future.

For the manager in headquarters on the other hand, the main message is that the design of the manufacturing network is more than a decision of what to produce where and how to organize the logistic flows. It is also about a strategic view on the role the plants play in the network. It is important to identify lead plants, and to exploit those plants as centers of excellence in the network. Yet at the same time, it is important to exploit some off-shore or server plants, since they offer strategic flexibility to the network. When business conditions change, they can fairly easily be replaced by other plants, in more favorable locations, offering new strategic advantages.

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FIGURE 1

Strategic role of the plant (Ferdows, 1989; 1997)

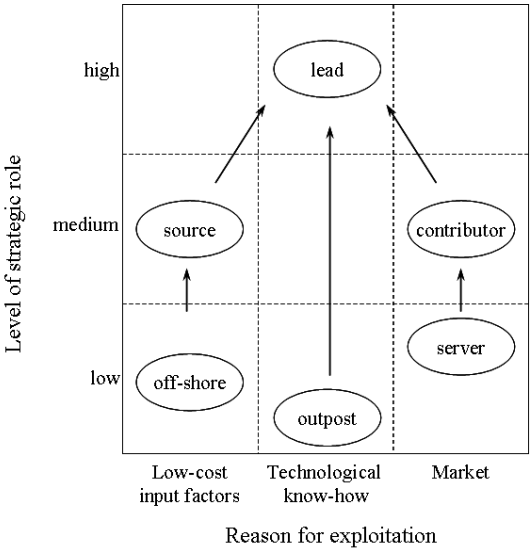

FIGURE 2

Strategic role of plants in 1995-1996

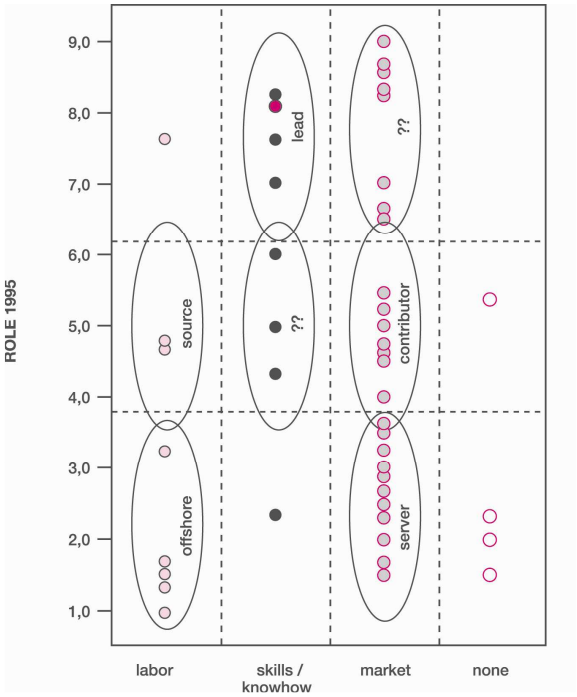

FIGURE 3

Location advantages of plants in 1995-1996

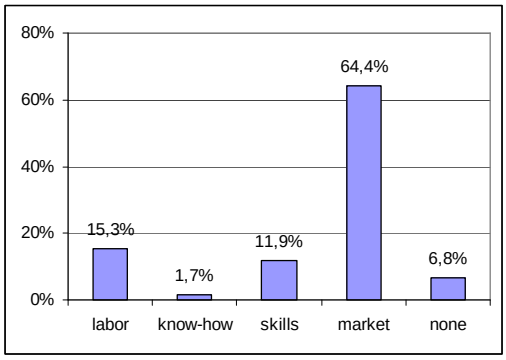

FIGURE 4

Evolution of number of plants since 1995

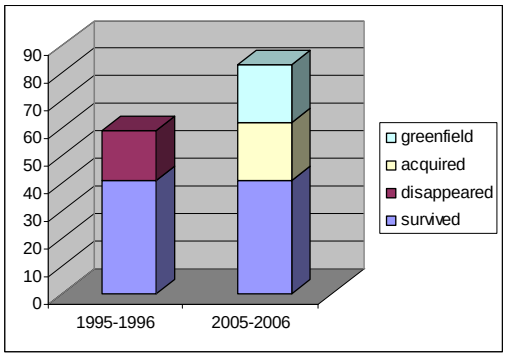

FIGURE 5

Strategic role of plants in 2005-2006

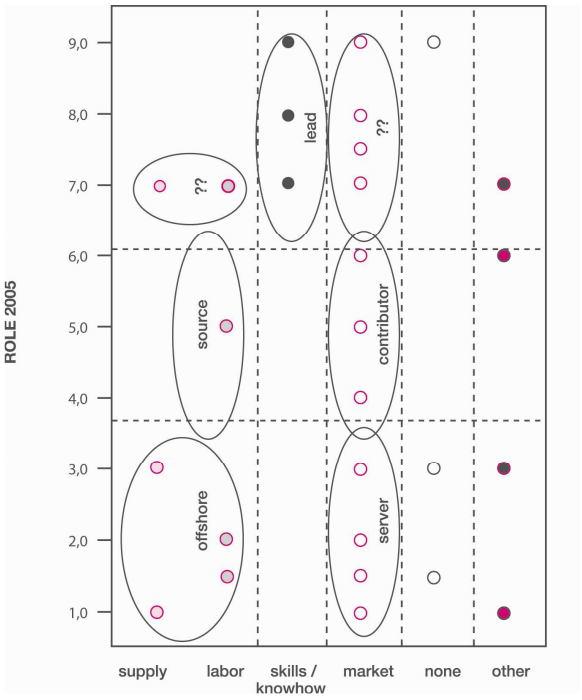

FIGURE 6

Location advantages of plants in 2005

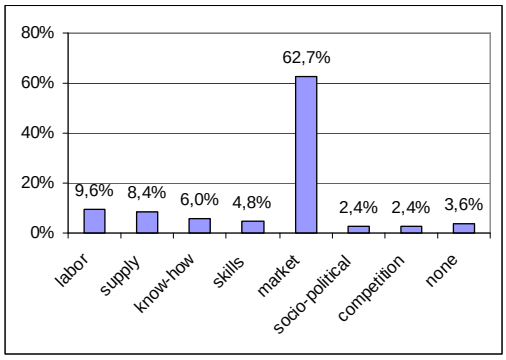

TABLE 1

Evolution of location advantages since 1995

primary advantage 1995	disappeared	survived	total
labor	6	3	9
know-how	0	1	1
skill	1	6	7
market	8	30	38
none	3	1	4
total	18	41	59

TABLE 2

History of location advantages in 2005

primary advantage 2005	new	survived	total
supply	6	1	7
labor	4	4	8
know-how	1	3	4
skill	1	3	4
market	28	24	52
competition	2	0	2
socio-political	0	2	2
none	0	3	3
total	42	40[1]	82

[1] Numbers in table 1 and 2 differ because of missing data

TABLE 3

Level of strategic role

in 1995-1996	N	average level of strategic role	mean difference	significance level
survived	41	5,09		
disappeared	18	3,52	1,58	0,02

in 2005-2006	N	average level of strategic role	mean difference	significance level
Survived	27	5,67		
New	35	3,54	2,12	0,002

FIGURE 7 –

Evolution of strategic role of plants since 1995 (plants that have disappeared are indicated in black)