FLANDERSDC
INSPIRING CREATIVITY

Knowledge partner

Vlerick Leuven Gent
Management School

the Autonomous Management School of
Ghent University and Katholieke Universiteit Leuven

RESEARCH REPORT

NETWORK RELATIONS IN MULTINATIONAL MANUFACTURING COMPANIES

Ann Vereecke

July 2007

FLANDERS DISTRICT OF CREATIVITY

Flanders District of Creativity is the Flemish organization for **entrepreneurial creativity.** It was founded in 2004 by the Flemish Government as a non-profit organization and enjoys broad support. Flemish businesses, academia, and public institutions use Flanders DC as a platform for cooperation in the pursuit of a more creative region. Creativity is the key ingredient to make companies more successful and to help regional governments ensure a healthy economy with more jobs.

Flanders DC inspires creativity and innovation:

1. by learning from the most **creative regions** in the world,
2. by igniting **creative sparks** in everyday life and business, and
3. through **research, practical business tools and business training,** provided in cooperation with the Flanders DC Knowledge Center.

1. Districts of Creativity: Inspiration from the most creative regions

Responses to global challenges are best found within an international network of excellence. Flanders DC aims to unite the most dynamic regions in the world within the 'Districts of Creativity' network, with the single aim of learning from the very best. Every two years, Flanders DC convenes the Creativity World Forum, bringing together government leaders, entrepreneurs, and knowledge institutions to exchange ideas about how to tackle pressing economic problems and make their regions hotbeds for innovation and creativity.

CREATIVITY WORLDFORUM
November 15-16, 2006 - Ghent, Belgium

FLANDERSDC
INSPIRING CREATIVITY

2. Raising awareness: The best way to predict the future is to invent it

Flanders DC encourages entrepreneurs and citizens to look ahead and find creative solutions today to tomorrow's problems. Flanders DC has developed an idea generation tool to encourage people and organizations to take the first step toward innovation. In addition, Flanders DC runs a general awareness-raising campaign entitled "Flanders'' Future."

jij bent FLANDERS' FUTURE

3. The Flanders DC Knowledge Centre: Academic support

The ***Flanders DC Knowledge Center*** entails a cooperation between Flanders DC and the Vlerick Leuven Gent Management School. Each year, the Flanders DC Knowledge Centre publishes several reports and develops various tools, case studies and courses. All these projects focus on the role of creativity in a business environment and identify obstacles to and accelerators of competitive growth.

The ***Creativity Talks*** give you a monthly update on these research activities.
See www.creativitytalks.be for an updated calendar and subscription.

Below is a list of the finished projects of the Flanders DC Knowledge Center. Published research projects can be downloaded via the library catalogue of the Vlerick Leuven Gent Management School http://www.vlerick.be/library/gateway.html or via www.flandersdc.be.

Research reports:

- ***De Vlaamse economie in 2015: Uitdagingen voor de toekomst***, Koen De Backer en Leo Sleuwaegen, September 2005, Published in Dutch
- ***Ondernemingscreativiteit als motor van groei voor Vlaamse steden en Brussel,*** Isabelle De Voldere, Eva Janssens en Jonas Onkelinx, November 2005, Published in Dutch
- ***The Creative Economy: challenges and opportunities for the DC-regions,*** Isabelle De Voldere, Eva Janssens, Jonas Onkelinx en Leo Sleuwaegen, April 2006, Published in English
- ***Spelers uit de televisiesector getuigen: een verkennende studie in de creatieve industrie,*** Marc Buelens en Mieke Van De Woestyne, Juni 2006, Published in Dutch
- ***Mobiliseren, dynamiseren en enthousiasmeren van onze (toekomstige) zilvervloot,*** Thomas Dewilde, Annick Vlaminckx, Ans De Vos en Dirk Buyens, Juni 2006, Published in Dutch
- ***Development of a regional competitiveness index,*** Harry Bowen, Wim Moesen and Leo Sleuwaegen, September 2006, Published in English
- ***Innovation outside the lab: strategic innovation as the alternative,*** Marion Debruyne and Marie Schoovaerts, November 2006, Published in English
- ***De creatieve industrie in Vlaanderen,*** Tine Maenhout, Isabelle De Voldere, Jonas Onkelinx en Leo Sleuwaegen, December 2006, Published in Dutch
- ***Het innovatieproces in grote bedrijven en KMO's,*** Geert Devos, Mieke Van De Woestyne en Herman Van den Broeck, Februari 2007, Published in Dutch
- ***Creatief ondernemen in Vlaanderen,*** Tine Maenhout, Jonas Onkelinx en Hans Crijns, Maart 2007, Published in Dutch
- ***Hoe ondernemers in Vlaanderen opportuniteiten identificeren. Een rapport met tips en tools voor de ondernemer in de praktijk,*** Eva Cools, Herman Van den Broeck, Sabine Vermeulen, Hans Crijns, Deva Rangarajan, Mei 2007, published in Dutch

Besides these research projects, the Flanders DC Knowledge Centre also developed following tools and training:

- ***Ondernemen.meerdan.ondernemen,*** an online learning platform
- ***Creativity Class*** for young high-potentials
- ***Flanders DC Fellows***, inspiring role models in business creativity

FLANDERS DC FELLOWS

The board of directors of Flanders DC:

Flanders Investment & Trade

IBBT

i-City

iwt

unizo
Unie van Zelfstandige Ondernemers

Vlerick Leuven Gent Management School

Kamer van Koophandel

INTRODUCTION

Innovation and know-how have become critical for competitiveness. Consequently, the role of relationships and networking has become very important.
We have shown in previous research that building relationships with suppliers and customers leads to better performance: in an empirical study on the metal working industries, we have seen that those companies with the highest levels of performance improvements were also the ones with the highest level of collaboration with customers and suppliers. (Vereecke and Muylle 2006)
Next to suppliers and customers, there are other external partners for networking. Universities and research institutes, for example, can be interesting partners for innovation exchange and information sharing.
Also, a lot can be learned from internal partners: other departments within the same unit, or other units in the company, for example sister factories.

Our research studies the latter type of networking. We have observed the networks of factories in multinational companies, and we have studied the position of these factories in the network, as well as the role each of the factories plays in this network.

This report tells the story of eight multinational companies over the past ten years. They all are manufacturing companies, with headquarters in or close to Belgium, and with factories in several regions in the world.
We have studied these 8 multinationals in 1995-1996; we have revisited them in 2005-2006, and will report on how these companies have changed their manufacturing network.
In both research rounds, our goal has been to identify the position and the role of each of the plants in the network they were part of. Our main hypothesis has been that the role and position of the plant in the network has some predictive value for the future perspectives of the plant. In this report we will explain and test this hypothesis, and will draw some lessons for both practitioners and policy makers.

Multinational companies studied

The companies that have been studied in 1995-1996 were:

- **Case A**: Company A was a manufacturer of steel products, with headquarters in Belgium, and with manufacturing units all over the world.
- **Case B**: Company was a producer of food products. The company had its headquarters in Belgium, and had manufacturing units in Europe and North America. At the time of the research, the company was establishing a manufacturing unit in the Far East.
- **Case C**: Company C was a packaging manufacturer for food products. Our research focused on the European subdivision of the company. At the time of the research, the division was headquartered in Belgium; the R&D activities were located in the UK.
- **Case D**: Company D was a manufacturer of electrical equipment. Headquarters were located in Belgium. The company had a global manufacturing configuration.
- **Case E**: Company E was headquartered in the USA. It was divided into three divisions: the USA, Mexico and Europe. Our research focused on the European division only, which had its local headquarters in Belgium. This division had manufacturing units spread over Europe. For part of its business, company E had established strong partnerships with some East European manufacturers. Although these suppliers were not legally part of company E, they were included in our research, since operationally they were tightly linked to company E.
- **Company F**: Company F was a family owned textile company, with headquarters in Belgium. The manufacturing units were mainly concentrated in Belgium, although two units were located abroad, namely in Ireland and in the USA.
- **Company G**: Company G was headquartered in the USA. The company produced plastic products. The European division had its operations headquarters in Belgium. The division produced in five European countries, and supplied the European market. This European division was also responsible for the plant in South Africa.
- **Company H**: Company H was a division of a large food company with headquarters in Belgium, and manufacturing units in Western Europe.

Ten years later, in 2005-2006, we revisited these companies. Several of them had gone through major changes over the past 10 years.

- **Company A**: Company A has become an even more global player, by establishing plants in Eastern Europe, China, India, Indonesia and Brasil.
- **Company B**: Company B has merged with another company; the combined company is a vertically integrated and global producer, with raw material plants in Africa and Latin America, and production facilities mainly in Europe, the USA and Canada.
- **Company C**: Company C has merged with another company, thus forming one of the world's largest packaging producers. The headquarters of the division studied are located in France.
- **Company D**: Company D was taken over by an Indian group. It is now a substantial part of one of the divisions of this Indian group. We have studied this entire division.
- **Company E**: Over time, the partnerships with the subcontractors in Eastern Europe have stopped, and Company E has established its own manufacturing facilities in China and India.

Whereas 10 years ago manufacturing was considered on a regional basis, it is now much more considered and managed on a global basis. Regional responsibilities have shifted into global responsibilities. Global headquarters are located in the UK.

- **Company F**: The major change in Company F has come from closing down some of its factories.
- **Company G**: The major change in Company G has been in rationalizing the plants network, which has resulted in the closure of one of the plants. Also, today part of the volume is sourced through subcontractors.
- **Company H**: Company H is now more integrated in the corporate structure than it was 10 years ago. It is managed from the central headquarters in Belgium. Over time, Company H has gone through some changes, that is, the closing down of some and the acquisition of other plants.

METHODOLOGY AND TYPOLOGY

Methodology of the 1995-1996 research study

The research reported here has been part of a larger, exploratory research study. Given the exploratory nature of the research, case research has been preferred over other research methodologies.

Data have been gathered at two levels of analysis: the plant and the company.

- Interviews have been conducted with the general manager and with manufacturing managers at headquarters. In total data has been collected on 59 manufacturing plants, through 37 interviews (with a total duration of approximately 120 hours). The number of interviews varied between 2 and 6 per case. A structured questionnaire with closed and open-ended questions has been used as a guide through the interviews.
- A second questionnaire has been sent to the plant managers and/or the manufacturing managers in the distinct production plants. 144 questionnaires have been sent to 54 out of the 59 plants. For five of the plants, headquarters asked us not to send a questionnaire to the plant managers. 83% of the questionnaires have been returned, from 50 plants. This implies that in total we have received data from the plant managers on 50 out of the 59 plants (85%). The number of questionnaires returned from the plants varied between 1 and 5 per plant.

More details on the research methodology can be found in Vereecke, Van Dierdonck and De Meyer (2006).

Methodology of the 2005-2006 research study

In the second round of the research, interviews have been conducted with one or two managers in the headquarters of each of the companies. We have used a structured questionnaire as the basis of the interviews. Through this questionnaire, the interviewees have been confronted with some of the questions as well as some of the results of the previous study, and have been asked to rate the plants again on their strategic role and their network position.

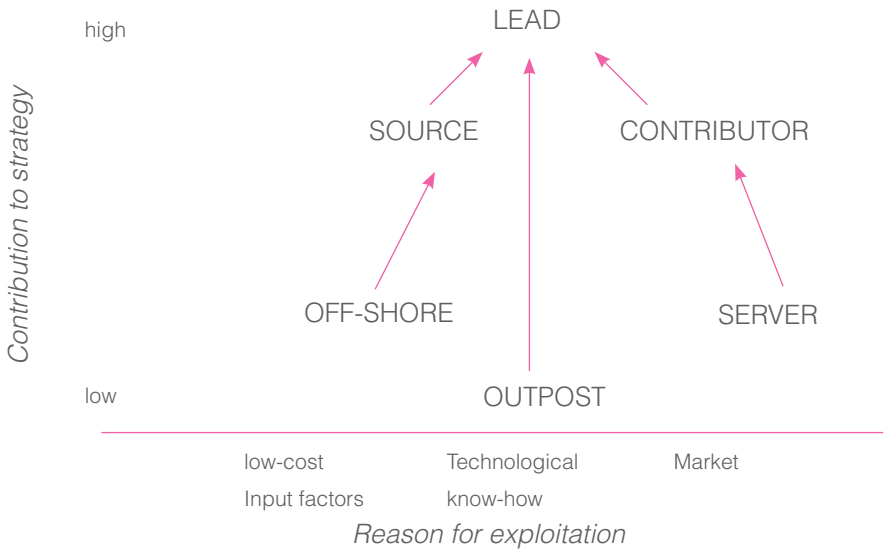
A plant typology – theoretical framework

We have researched the plants in the eight multinational companies using *two typologies*.

The *first typology* has been the "**strategic role of the plant**", as described by Ferdows. (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 the 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.

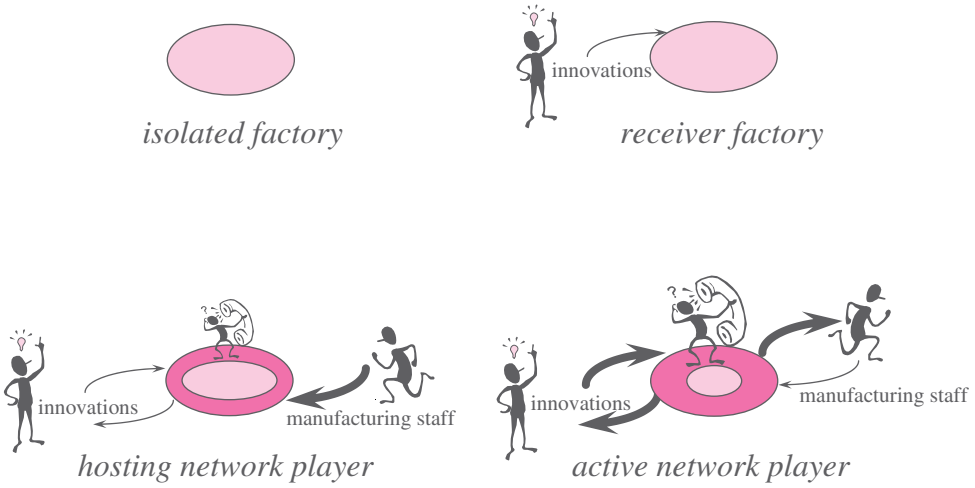
Figure 1 Strategic role of the plant (K. Ferdows)



The *second typology* (see Figure 2) has been deducted from the initial research results in 1995-1996. It describes the position of the plant in the network of information and people in the company. Based on the data collected in 1995-1996, using cluster analysis, we have classified the factories in four broad though essential categories of factories. The four categories differ mainly in the extent to which the factories have established network relationships with other factories in the network and/or with headquarters. As stated earlier, our focus has been on the role of the factories in the network of knowledge. Thus we have studied the knowledge flows in

the manufacturing network. These knowledge flows have different "formats". An important one is the transfer of innovations in the network. Indeed, an explicit flow of knowledge takes place whenever innovations developed in a site are transferred to and implemented in a factory in the network. A second and informal flow of knowledge occurs when managers of different sites talk to each other, or visit one another's site. Therefore, the level of communication between managers across factories has been measured, as well as the number of days manufacturing staff people from each factory have visited the other factories in the network. The detailed description of the knowledge flows and of the clustering procedure can be found in Vereecke, Van Dierdonck and De Meyer (2006).

Figure 2 Network position of plants – typology (Vereecke, De Meyer, Van Dierdonck)



Based on the measurement of these flows we distinguished four types or categories of factories (Vereecke and De Meyer 2006).

- The first category of factories consists of the "*isolated*" factories in the network. Few innovations reach this isolated factory and few innovations are transferred from here to other units; few manufacturing staff people come to visit such a factory, and in reverse also few manufacturing staff people from this factory go visit other factories. Moreover, there is little communication between the manufacturing staff people of this factory and the other manufacturing managers in the network. The packaging manufacturer in our research showed quite a few isolated factories. These factories are typically high performers, supplying commodity products to their local market, and relying on their own capabilities to improve their manufacturing processes. Some of them are green field factories, which run in an efficient, reliable and independent way.
- Similar to the isolated factories are the "*receiver factories*". They differ from the isolated factories on one aspect only: they receive quite a few innovations from other factories in the network and/or from headquarters. There can be a few different reasons for this 'injection' of innovations in the receiver factory. Some of these factories are underperforming, and need external support to get the factory up to standard. Others are located so close to one of the sister factories, that they are run as 'satellite factories', under the supervision of the

management team of the neighboring, typically larger, factory. Still other factories have to rely on external support to keep up to speed with rapidly changing technological innovation. A nice example in this respect is a state-of-the-art steel products factory. This factory was the experimental unit in the network for the application of Computer-integrated Manufacturing. It was supposed to become the 'model factory' for the future, with zero defects and zero interruptions. In order to accomplish this, the factory received a lot of support from other factories and from development teams in the company.

- The third category of factories is very different. This category consists of factories that have established strong network relationships. These network players show a high level of communication with other units in the network and they exchange a lot of innovations with the other units. They not only transfer innovations to the other factories, they also benefit from innovations developed elsewhere. Typical for these factories is that they are frequently hosting visitors from other factories in the network and from headquarters. This is why we have labeled them the '***hosting network players'***. Quite a few of the hosting network players in our research were the factory closest to headquarters. They thus had automatically a central position in the network. Some interviewees referred to this factory as the 'mother factory'. An example of a hosting network player was the steel products factory located about 50 km from the headquarters. This factory was very flexible, and produced a large range of products, for a broad geographical market; its location close to the technical development center in headquarters turned this factory into a prototype testing center; engineers from all over the world would go through training in this factory; finally, the factory was considered to be a center of excellence for part of the product range of the company.
- The main difference between the hosting network players and our fourth category, the '***active network players'***, lies in the intensity of communication and of innovation transfers, and the dominant direction of the flows of visitors. These are factories that communicate intensively with other units in the network; they share very actively innovations with other units; and they are not only hosting visitors from other factories, they also pay lots of visits to the other factories.

Operationalization of constructs

Level of strategic role of the plant

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.

Main reason for exploitation

We have asked our respondents to indicate on a list of potential reasons for exploitating plants (see Exhibit 1) the three main reasons for each of the plants.
In the 1995-1996 study, we have 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 today. This allows us to compare over time the advantages plant locations offer to the network as a whole.

Network position of the plant

In describing the manufacturing network of a multinational company, the network units considered are all the plants and the group of managers in headquarters responsible for manufacturing (in this report referred to as “headquarters”). The network relationships considered in this research are the flows of innovation, the use of coordinators and the communication between the units in the network.
The network position of the plant has been measured in the 1995-1996 study in a detailed and rigorous way.

- The innovation transfers have been measured by asking managers in the plants (through the mail questionnaires) and in headquarters (through the interviews) to enumerate and describe the transfers of product, process and managerial innovations they know of over the past three years. The information that has been gathered from these different sources has been checked, complemented and corrected by at least one manager in headquarters, in the course of the in-depth interviews.

- The presence of coordinators has been operationalized as the extent to which people are traveling from one unit to another. This information on people flows has been collected through the mail questionnaire to the plants. The respondents had to report the number of days they had spent, over the previous year, in headquarters and in each of the plants in the company's network.
- One of the questionnaire items measures the communication between the managers in the plants and in headquarters. We have provided our respondents with a list of all manufacturing staff people, and have asked him/her with whom on this list he/she has communicated daily, weekly and monthly.

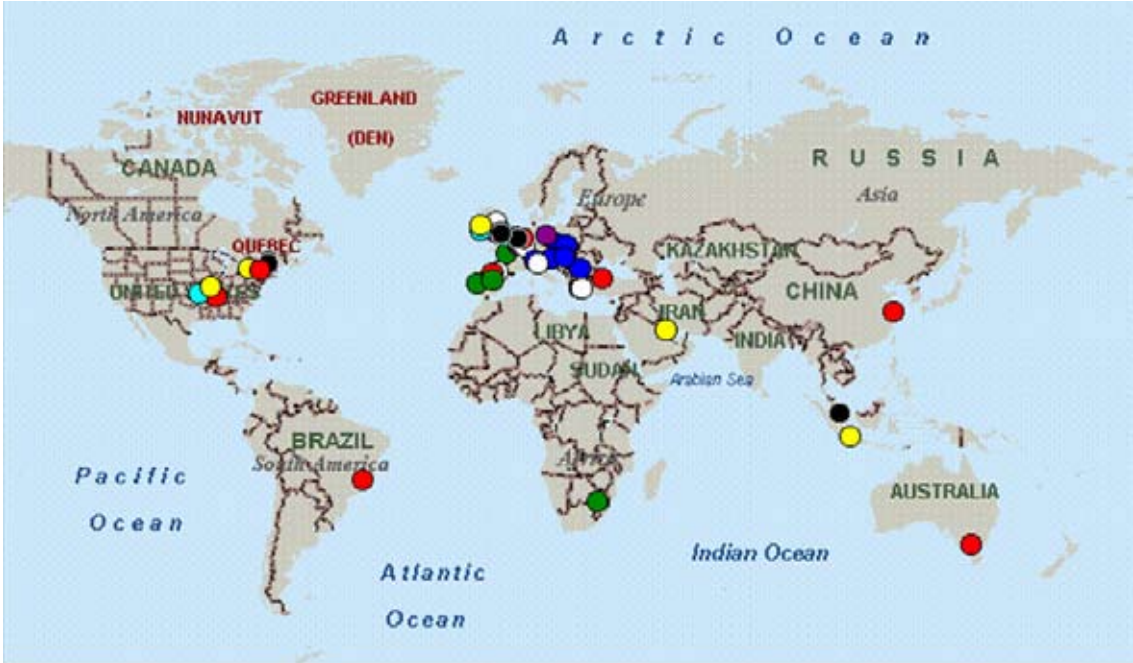
We have used cluster analysis to identify different types of plants, according to their position in the know-how network of their company.

In the 2005-2006 study, the approach has been different, given the limited scope of the study. The plants have been classified as “isolated”, “receiver”, “hosting network player” or “active network player” by asking the interviewees which of the 4 descriptions best matches each of the plants. In a future phase of the research, we plan to measure the network position of the plant using the same methodology as in the 1995-1996 study.

RESULTS OF THE 1995-1996 RESEARCH STUDY

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. (See Figure 3)

Figure 3 Location of plants studied in 1995-1996

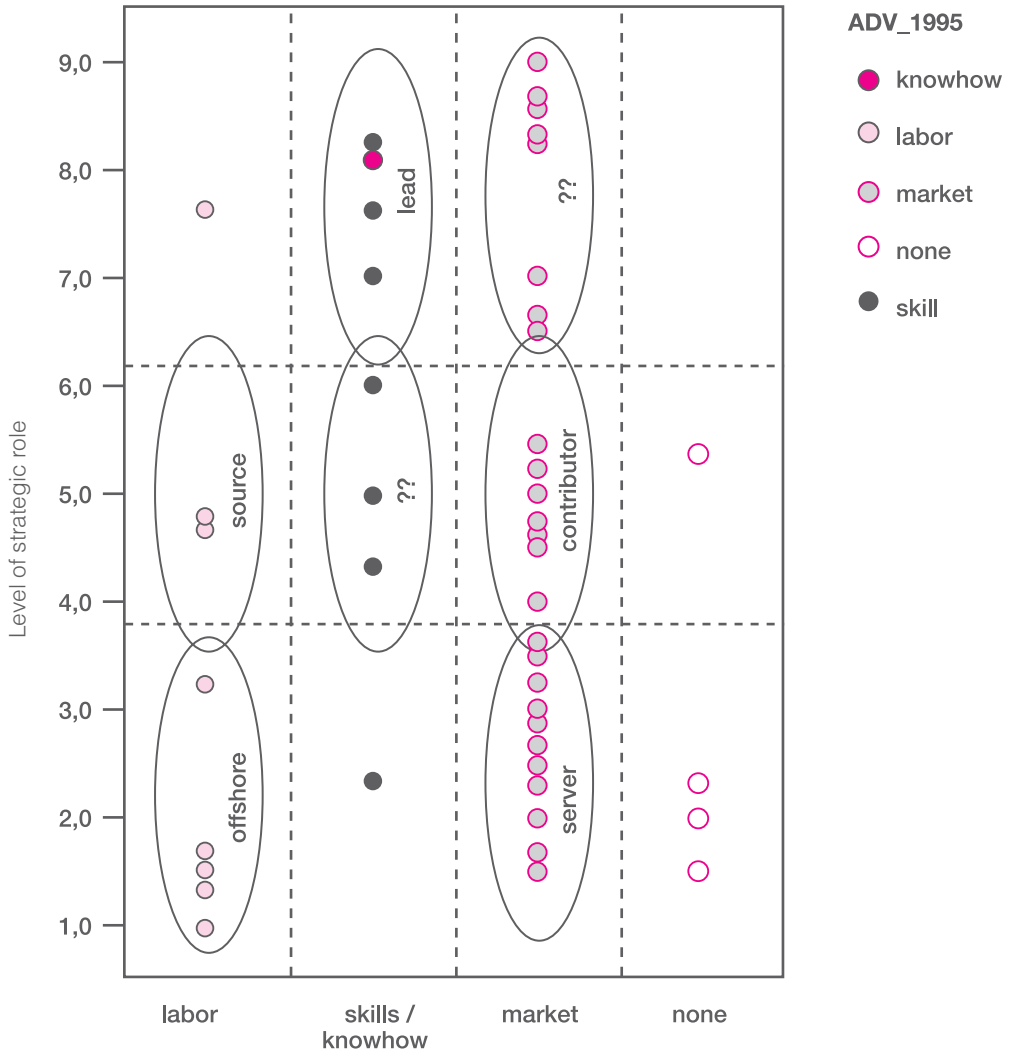


Plants by multinational and by city in 1995

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

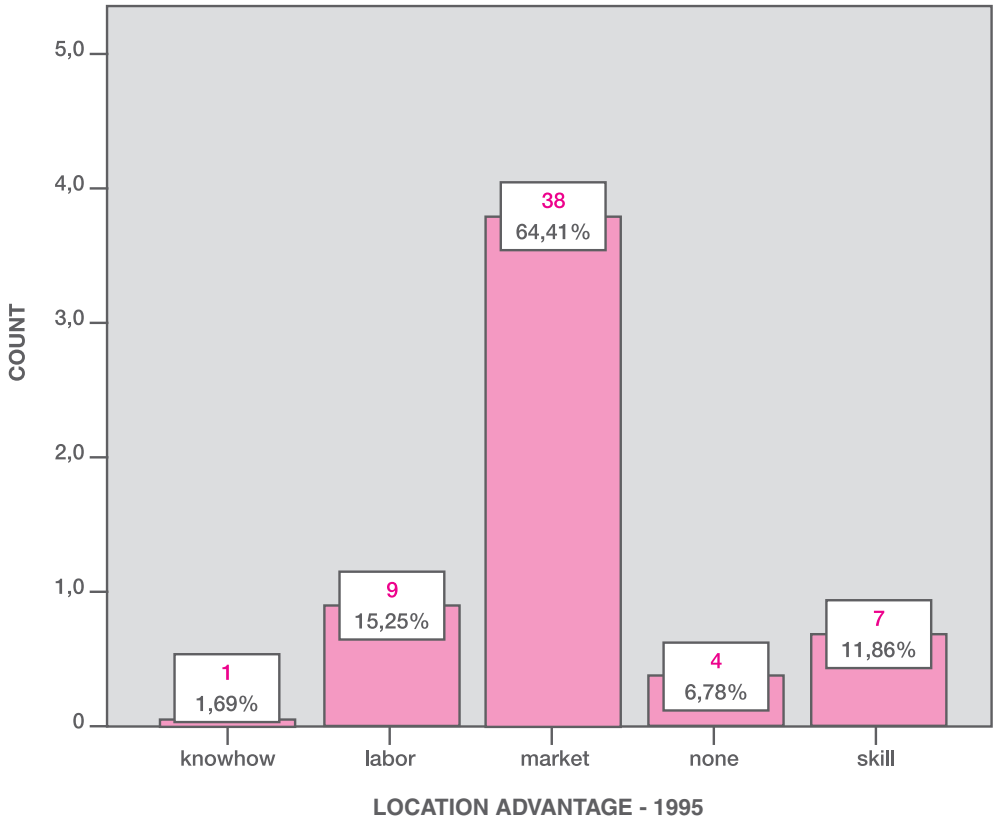
One of the conclusions from the 1995-1996 study was that our case data nicely illustrated Ferdows' model, as can be seen in Figure 4: we concluded that indeed the main advantage of exploiting the plants fell into the three categories put forward by Ferdows: proximity to inputs (mainly low labor cost), 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, 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.

Figure 4 Strategic role of plants in 1995-1996



As can be seen in Figure 5 the dominant factor explaining plant location was the market proximity. This was the case for local plants as well as for plants abroad. We conclude that, even though offshoring for cost reductions was important, our multinationals still had the market as their main driver for their internationalization strategy.

Figure 5 Location advantages of plants in 1995



The data also showed that, although there was a diversity of reasons for establishing or acquiring a plant, some of these reasons tended to fade over time. Figure 6 shows that *market proximity* was by far the most stable location driver. Almost all the plants that were established in order to be close to a market, still had their market proximity as their main advantage.

Labor and skills appeared to be less stable location drivers. For some plants (6 out of 11), it was still the major advantage, but other plants seemed to have found other advantages that replaced the labor advantage.

The *socio-political drivers* appeared to be highly unstable. None of the plants in our sample that had been established for socio-political reasons, had these socio-political reasons still as the major advantage in 1995-1996. The most unstable location drivers were those drivers that have a "once-only" character. *Tax breaks or financial incentives* are typically provided at the moment of the acquisition, or on a temporary basis. These drivers therefore influence the initial decision, but don't provide a lasting major advantage. *Overcoming trade barriers* was an important driver for the establishment/acquisition of plants: it has been mentioned as the primary initial driver for six plants in total. As of 1995, it was not mentioned as the primary advantage of exploiting any of the plants, which can be explained by the decline in tariffs as a consequence of agreements such as the European unification and NAFTA.

The same remark was true for the acquisition of plants in order to *prevent competition* from acquiring the plant or in order to capture the market supplied by the plant. Once the plant is part of the network, the threat of competition entering the market has diminished. As soon as the

customer base of the plant is internalized, the company may probably consider supplying these customers from one of its other plants, if this proves more appropriate for cost or other reasons. The one-to-one relationship plant-customer thus becomes more vague.

Figure 6 Shifts in location advantages of plants - 1995

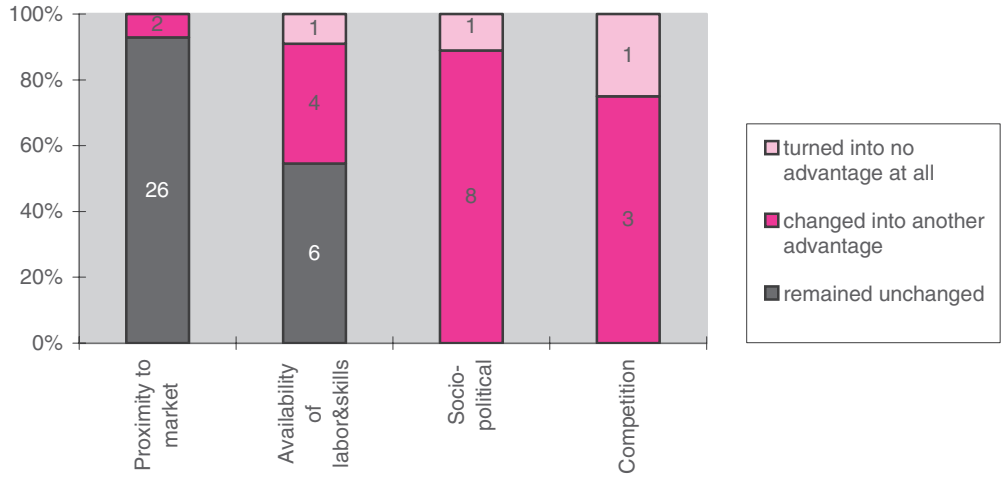
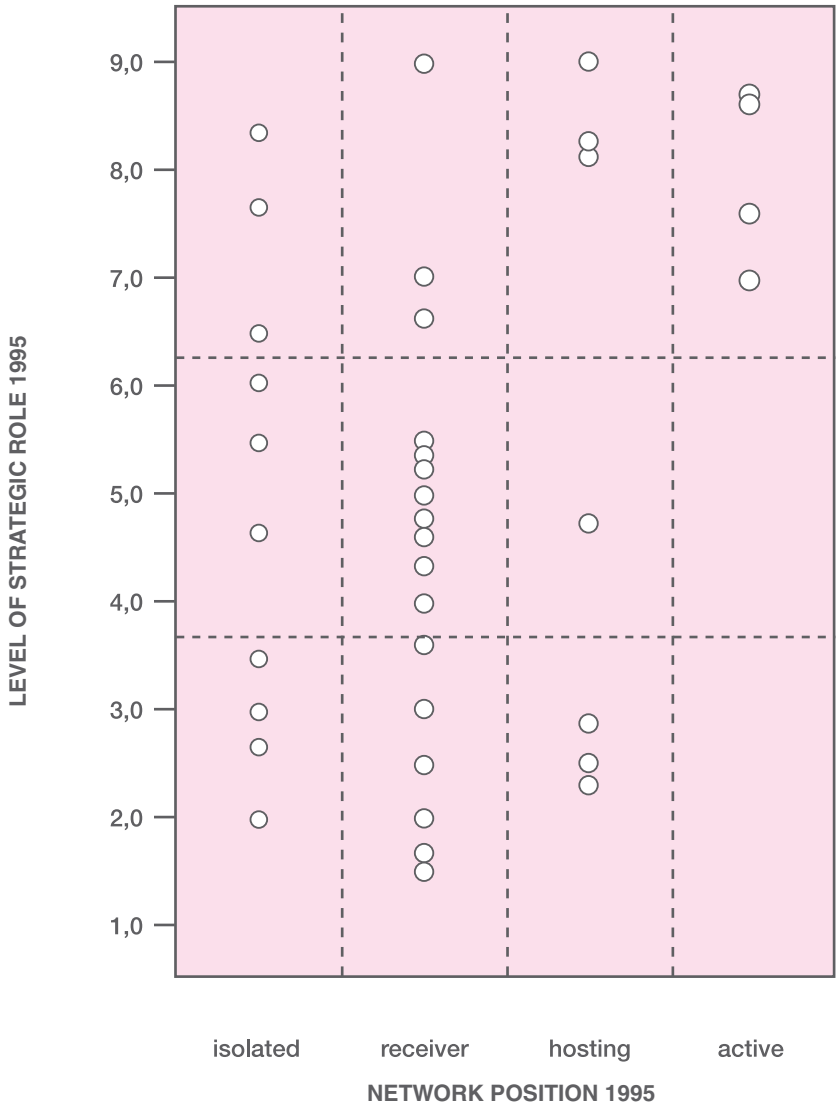


Figure 7 shows the position of the plants in their network, and links this network position to the level of strategic role of the plants. It will not come as a surprise that the isolated and the receiver plants in our research scored relatively low on the vertical axis of Ferdows' model, that is on the level of the strategic role of the plant (that is, on average, 4,8 and 4,5 on the 1-to-9 Likert scale for isolated and receiver plants respectively). The hosting and active network players on the other hand, scored relatively high in terms of level of strategic role (an average 5,8 and 8,0 respectively).

Also, we found that in the categories of the network players (active and hosting) only marginal changes were expected in the importance of the strategic role played by the plant, whereas substantial changes were expected for the isolated and receiver plants. Several of the isolated and receiver plants were expected to experience an increase in strategic role. Several other plants in this category of isolated and receiver plants were expected to experience a decrease in strategic role. This gave us the impression at that time that these two clusters of non-integrated plants would turn out to be less stable than the two clusters of integrated plants in the years to come. This has been one of the reasons for going back to the 8 multinationals after 10 years to investigate their manufacturing network and compare it over time.

Figure 7 Network position and level of strategic role 1995-1996



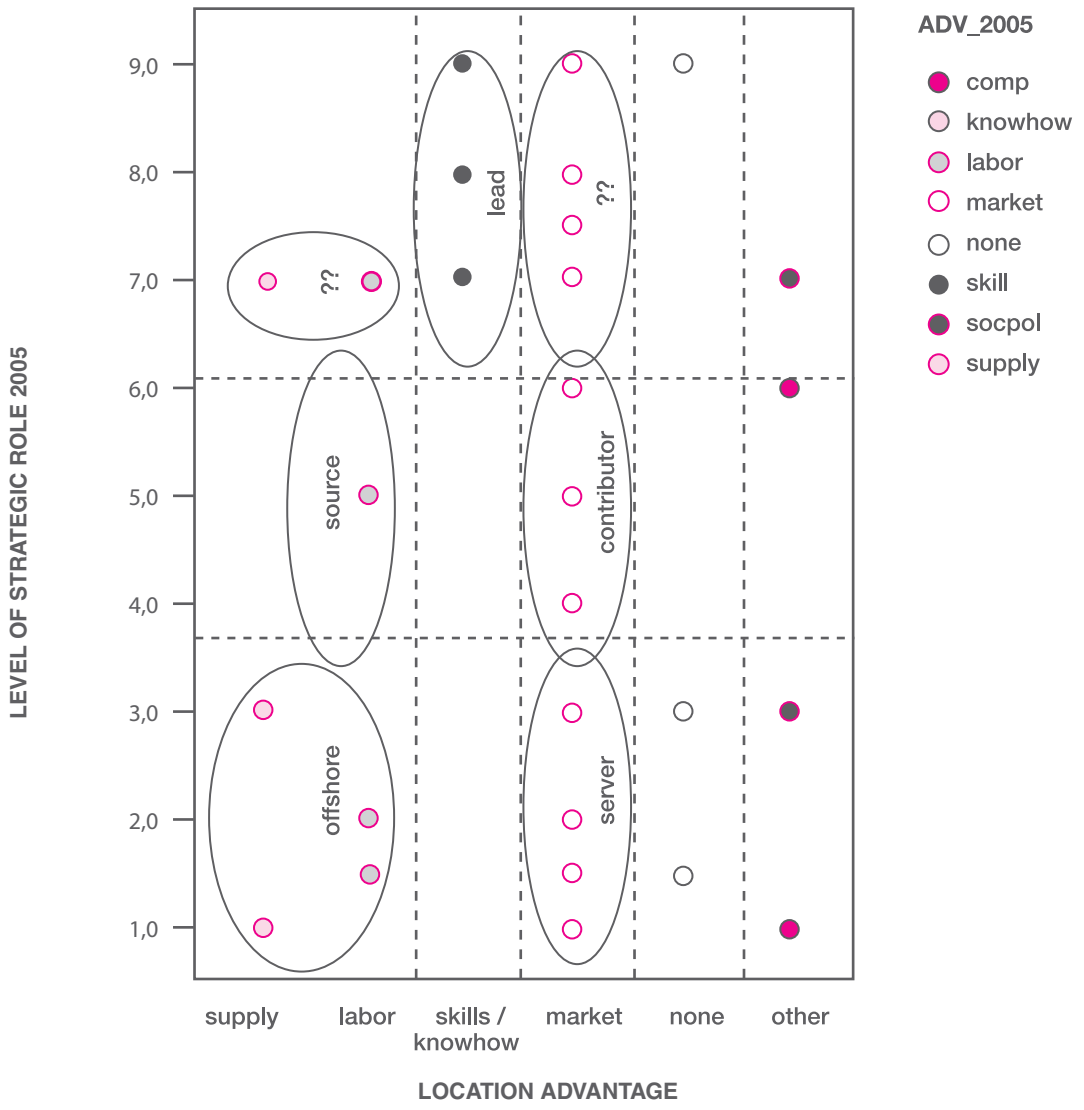
By 2005-2006, the 8 multinationals consisted of 83 plants: 42 plants were located in Europe (of which 12 in Belgium), spread over 13 different countries. The other 41 plants were spread over 18 different countries in East Asia and the Middle East, the USA and Canada, Africa and Australia. A first striking change is the increased globalization over the past 10 years: whereas in 1995-1996 the plant networks of the 8 multinationals were dominantly European with a few sites in other continents, today they have become truly global.

Figure 8 Location of plants studied in 2005-2006

Plants by multinational and by city in 2005

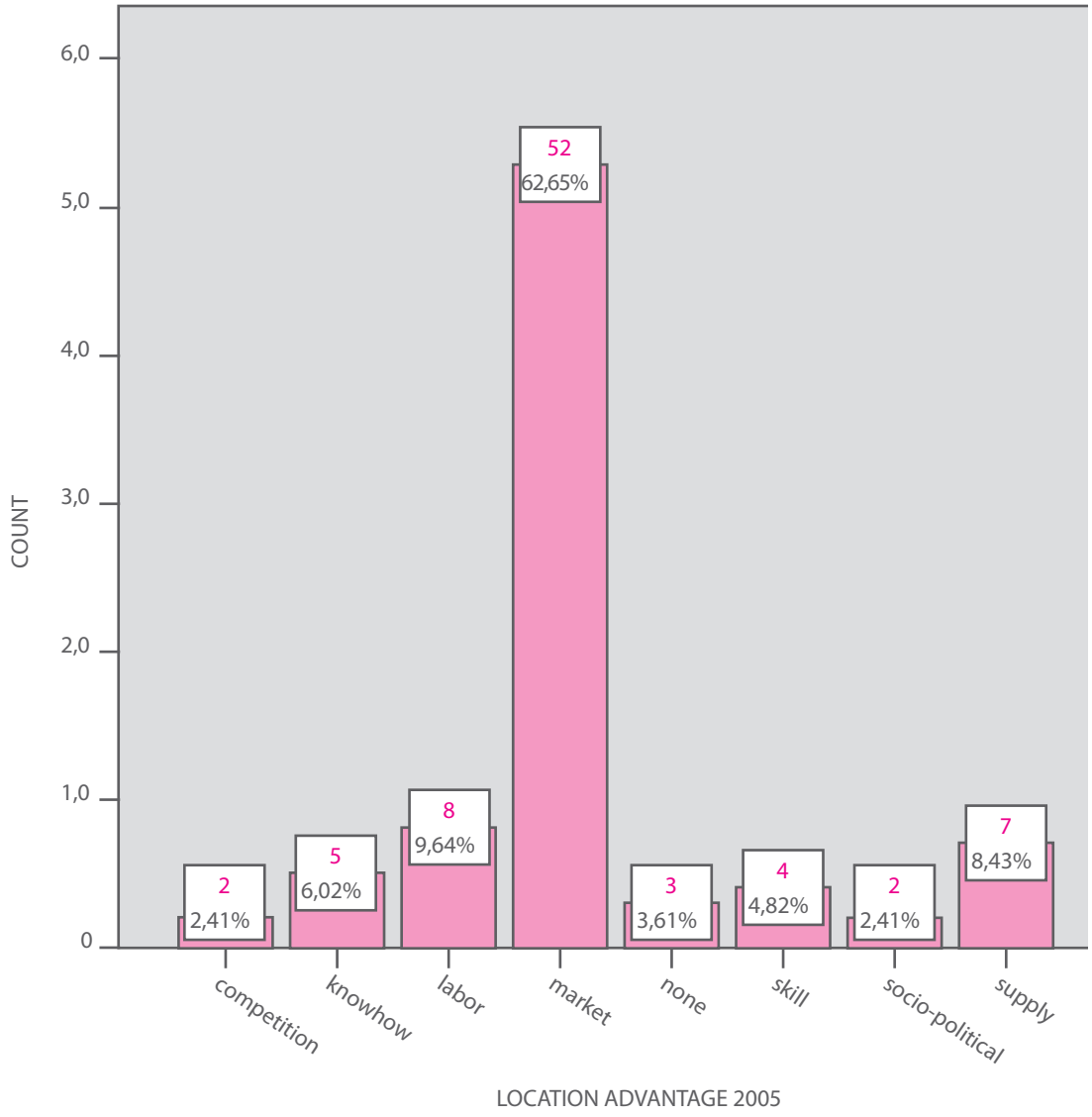
Figure 8 positions the 82 plants we have studied in 2005-2006 in Ferdows' framework.
As in 1995-1996, we find some plants with a high level of strategic role, yet have market proximity as their main location advantage. These plants seem to act as a center of excellence in the network, even though skills and know-how is not their primary location advantage. We also observed two factories which have input factors as their main advantage, and yet act as center of excellence. Ferdows' framework falls short of a label for such factories.
It is also interesting to observe that, as in 1995-1996, some plants seem to have lost their location advantage at all.

Figure 9 Strategic role of plants in 2005-2006



As Figure 10 shows, 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 is taken place. Yet, we have to conclude that cost is not the only, and also not the main factor in the internationalization strategy of our multinationals.

Figure 10 Location advantages of plants in 2005



Of the 59 plants in the networks in 1995-1996, 18 have disappeared, while 40 new ones have joined the networks. Table 1 and Table 2 give some details on this evolution.

Table 1 Evolution of location advantages since 1995

primary advantage 1995	gone	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**

Thirty-one percent of the plants which were in the plant network in 1995-1996 are not there anymore today (see figure 11). 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.

Figure 11 Evolution of number of plants since 1995

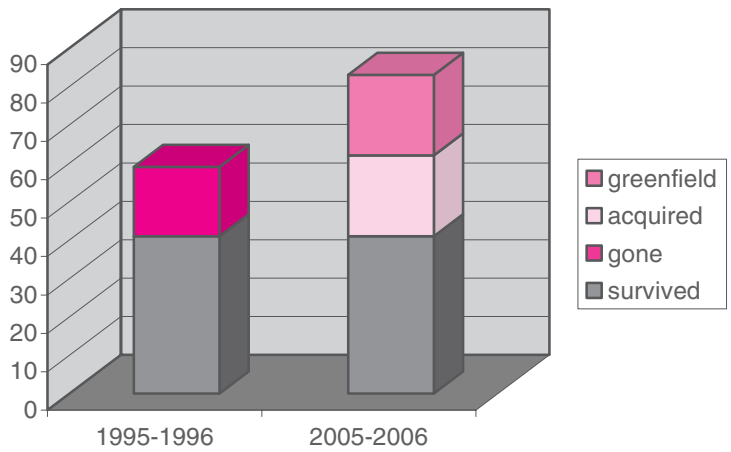


Table 1 shows that proportionally less plants which have the market or skills and know-how as their main location advantage have disappeared; while proportionally more plants which have labor cost as their main advantage have disappeared. It will be no surprise that 3 of the 4 plants for which no location 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 lack of any major advantage is a less stable condition for a plant to operate in.

Table 2 History of location advantages in 2005

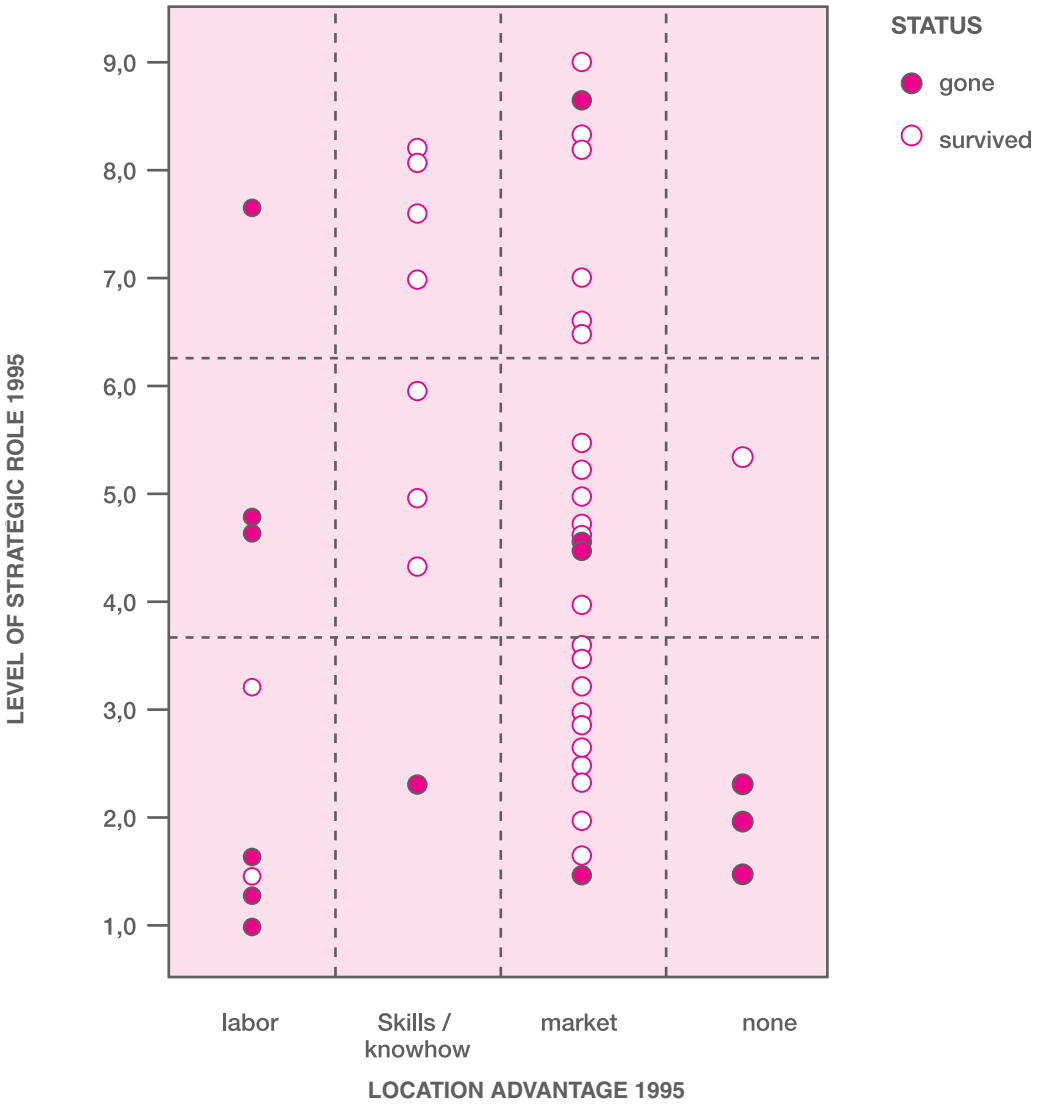
primary advantage 2005	new	survived	total
supply	6	1	7
labor	4	4	8
know-how	1	3	4
skill	1	3	4
market	28	24	52
competition	2	0	2
socio-political	0	2	2
none	0	3	3
total	**42**	**40**[1]	**82**

As Table 2 shows, half of the plants in the network today have been added to the network over the past 10 years. About half of these new plants have been added to the existing networks via mergers or acquisitions; the other half has been greenfield plants.
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.

Figure 12 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 ones are “gone”, either because they have been closed, or because they have been sold, or because the partnership has been stopped.

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

Figure 12 Evolution of strategic role of plants since 1995

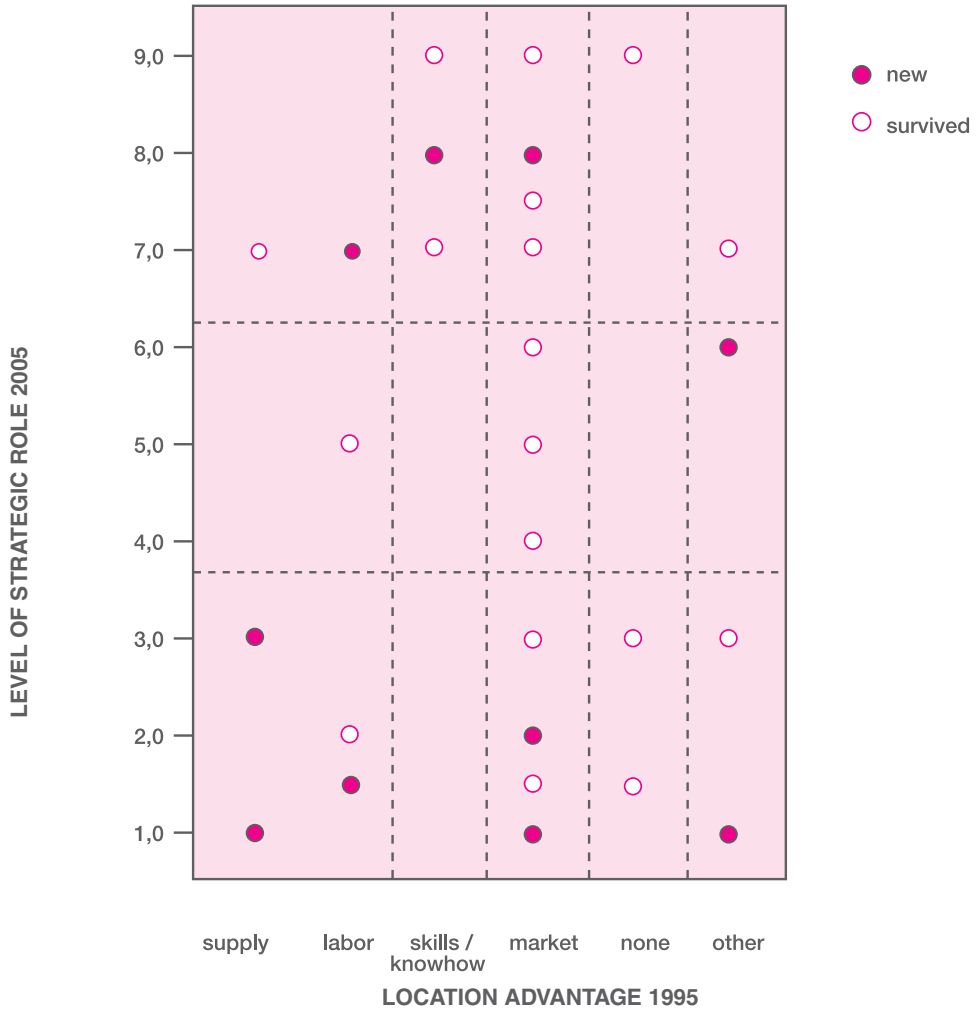


This figure shows that almost all of the offshore and source plants have left the networks. Also, some of the server and contributor plants are gone. It is also striking that the three plants with low level of strategic role, and for which the location advantage had disappeared, are not there anymore.
This suggests that source and offshore plants have an uncertain future, whereas the role of the lead plant seems to provide guaranteed future.

Figure 13 shows for today's plants, which ones have been in the network for more than 10 years, and which ones have joined the network over the past 10 years.

We can see in Figure 13 that almost all categories of plants (in terms of their strategic role) have joined the networks.

Figure 13 History of strategic role of plants in 2005



We conclude from the previous discussion that the ***strategic role*** has some predictive value for the future of the plant.
We now will investigate whether the ***network position*** of the plant has any predictive value.

Figure 14 maps the plants according to both the network position and the level of strategic role of the plant.

As we can see in Figure 14 and Table 3, several of the isolated and receiver plants have disappeared, whereas none of the hosting network players, and only one of the active network players have disappeared. We should note here that this active network player has indeed been closed, but most of its activities (and likewise its personnel) have been transferred to another plant of the company, located close to the active network player. So whereas the plant itself has been closed, its activities have remained in the region.
The conclusion is clearly that network players have a more stable future than the isolated and the receiver plants. As discussed earlier, this conclusion was expected on the basis of the results of the 1995-1996 study, and has now, after 10 years, indeed been confirmed.

Figure 14 Evolution of network position of plants since 1995

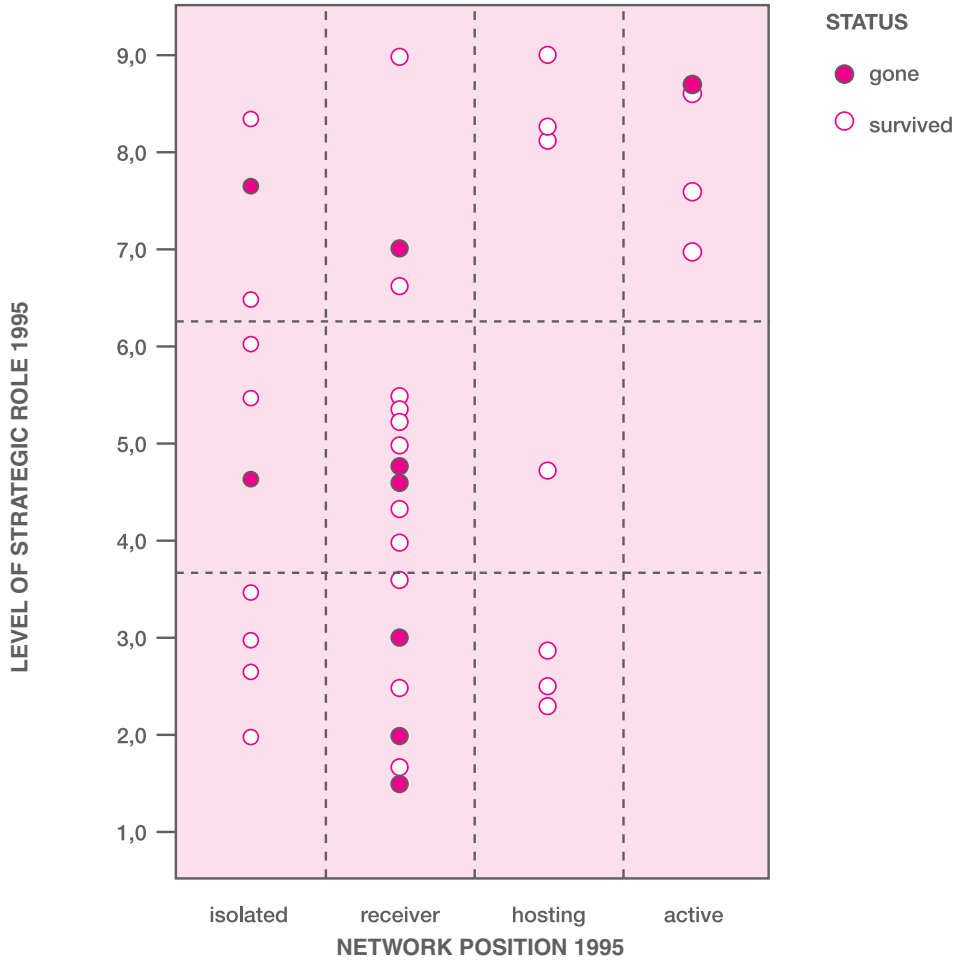


Table 3 Evolution of network position of plants since 1995

network position 1995	gone	survived	total
isolated	2	9	11
receiver	7	19	26
hosting	0	8	8
active	1	3	4
total	**10**	**39**	**49**

Figure 15 and Table 4 show that the new plants in the networks take all kinds of network positions. However, the majority (22 of the 38) of the new plants take the position of the receiver in the network. This indicates that a receiver plant is an “easy” add-on to a network. Stated differently, receiver plants (as well as isolated plants) offer ***strategic flexibility*** to the network. Again, this result was expected in the 1995-1996 study. It was shown then that building a network position takes time. Especially the hosting network players had typically been in the network for many more years than the isolated and receiver plants. This implies that expansions to the network

can more easily been done by adding isolated and receiver plants, than by adding hosting or active network players. We would like to use the image of "copy/paste" plants for expansion to the network. A receiver plant, and eventually an isolated plant, can more easily be pasted into the network.

Or, as one of the interviewees put it:

- "It has been an explicit decision to start building spearheads. However, this is not easy, and therefore not all plants are expected to become network players. A receiver plant plays a positive role in the network."
- "An isolated role is not necessarily a negative role. The isolated role of both plants is justified: Plant X is a very efficient plant that keeps on going without the need for external input; Plant Y is innovative. However, it is the only plant in the network that produces this kind of product, so there is no need to share innovations with other plants. If in the future the activity grows, it might develop into a networking role."

Figure 15 History of network position of plants in 2005

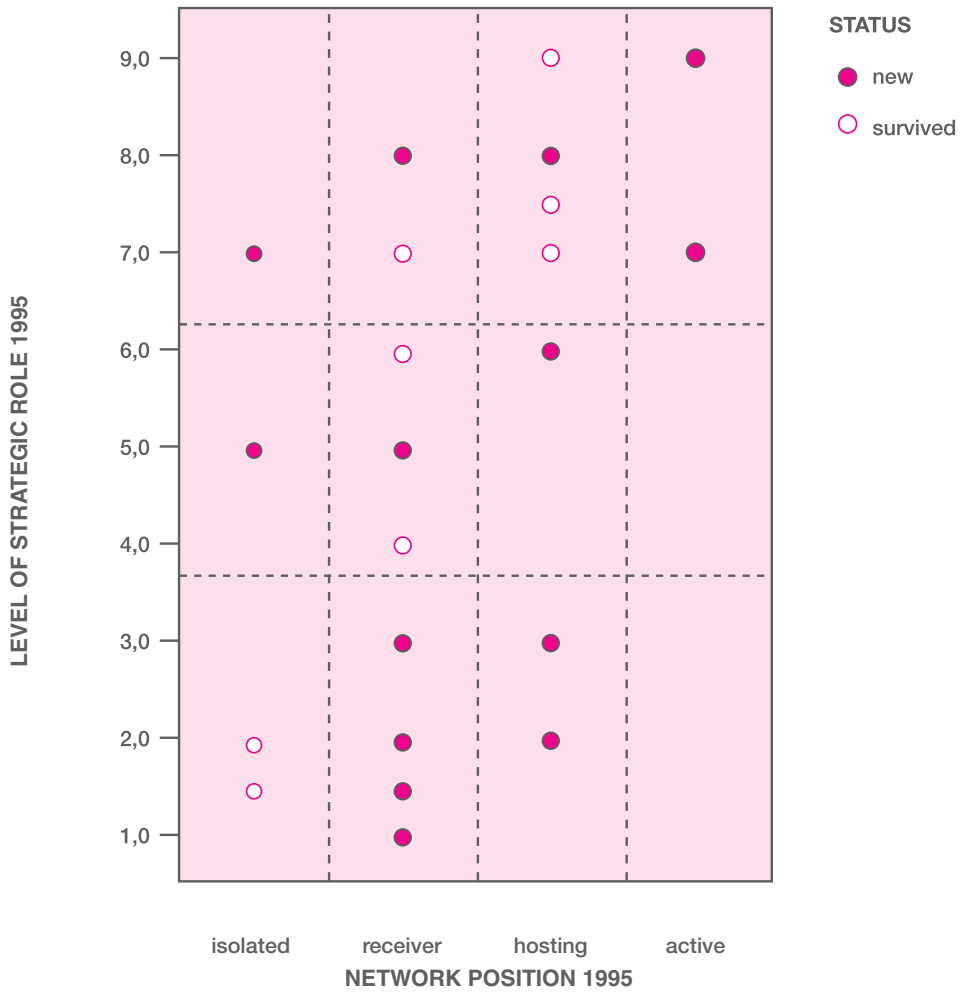


Table 4 History of network position of plants in 2005

network position 2005	new	survived	total
isolated	2	2	4
receiver	22	18	40
hosting	4	9	13
active	10	11	21
total	**38**	**40**	**78**

A surprisingly high number of (active) network players have been added to the networks, as can be seen in Figure 16 and Table 4. However, this result has to be interpreted with care. We should repeat that the network position has been measured in 2005-2006 study by asking the respondent what position the plants take according to their perception and judgment. It may well be that some of the plants have been classified as "active network player" because this seems more desirable. Ideally, the network position of the plants as of today should be measured in the same way as we have measured it in 1995-1996. That is, by sending questionnaires to each of the plants, and by measuring the flow of innovations through in-depth interviews with several managers. This time-intensive research has not (yet) been done.

On the other hand, we do have indications that the level of inter-unit activity has increased over the past ten years. Many interviewees have stressed the importance of networking, as can be witnessed in the following comments:

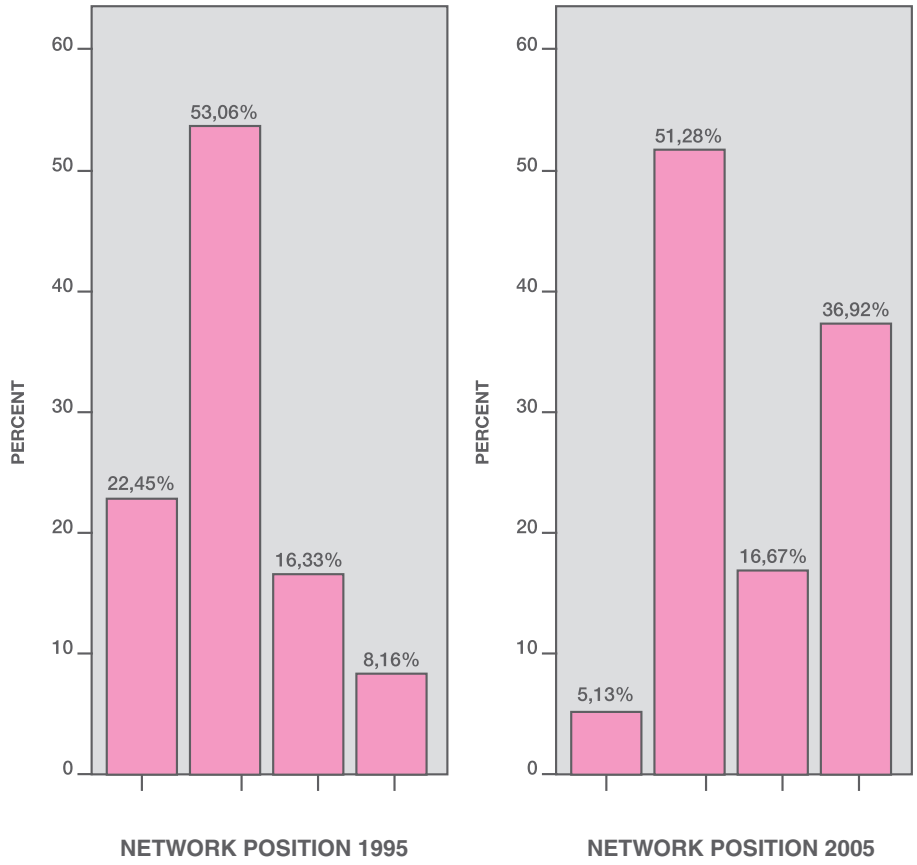
- "Active and hosting network players carry a lot of know-how. This is very "time constant". It is saved in the heads of people, and therefore has little mobility. But even know-how is perishable. Even plants that have the know-how need to upgrade themselves. In order to remain a network player, a plant should not react in a defensive way and rely on its know-how. The role of an active network player is a necessity for the future."
- "Working groups have been defined to identify learning opportunities across plants. It starts with identifying some quick wins to make the plants learn from the other plants. An investment plan is made to bring all plants to the same level."
- "The company made a huge step compared to 1996 in this respect. We have broken with this situation (of receiver and isolated plants) which was a result of the history, of the mix of different cultures, of people being shy and modest in what they could bring. (…) The company's big success is that it has become a real open company. There are regular meetings by function (HR, production, quality, logistics), in headquarters or in the plants, every year. No doubt, all plants are network players now. If not, it would have been a disaster! They have had training, people have been transferred to the plants. The change has been imposed on us by the difficult business environment. (…) Moreover, it is the way competition works. We simply have no choice."
- "A best practices network/database has been developed, there are simple and shared KPIs to make comparison easy, there is an intranet system for sharing experience, where needed a smaller group of plants is composed. These actions have turned us into an active network player company."
- "There are regular meetings of the site managers, on a regional basis. These meetings mostly take place in one of the factories."
- "There are small teams of people in charge of process improvements. They visit a plant, and audit a line in this plant, together with the person responsible at the site and with the

specialists from the other sites. They analyse KPIs, check how the line is controlled, … and they compare with other sites. In doing so, best practices are identified and know-how is shared. It also stimulates competition between the sites. The goal of this practice is to reduce the cost with 5% each year. So in fact, there are no real isolated plants in the network."

- "There is in general more networking than in the past: a lot of traveling, but also a lot of virtual meetings (conference call, telephone councils)."
- "In the past, the company considered know-how as very specific to each of the plants. Today, the company tries to benefit from the sharing of know-how. The plant is starting to take a more active position: now and then, people from the plant travel to other plants to set up new lines."
- "The plant acts as a host: it shares innovations with other players in the network, its staff frequently visits other plants, and staff from HQ frequently visit the plant. However, there is strong pressure to make the plant play an active network role. The plant has to become a centre of excellence, but this takes time. Informal contacts need to grow in the short term."

The empirical evidence, in combination with the interview comments, indeed indicate that the number of network players has increased.

Figure 16 Evolution of network position of plants since 1995



CHANGES OVER THE PAST 10 YEARS IN BELGIUM: 2006 VERSUS 1996

It will not come as a surprise that the number of plants in Belgium has decreased, as can be seen in Table 5. While in the initial study 15 of the 59 plants were located in Belgium, in the 2005-2006 study only 11 of the 82 plants are located in Belgium. So, in absolute as well as in relative terms, Belgian plants have made space for plants abroad in the networks. The ones that remain in Belgium (and the very few that have been introduced in the networks) are here because of the availability of skills and know-how, or because of market proximity. (see Table 6 and Table 7) As we have seen, these are stable location advantages. However, it should be noted that for two of the Belgian plants, no major location advantage has been mentioned, which puts a serious burden on the plant, as we have discussed in the previous chapter. It is striking that of the three plants which had no main location advantage in 1995, only one has survived. This plant, however, has recently been downsized substantially.

Table 5 Location advantage in Belgium

primary advantage	initial	1995	2005
supply	0	0	0
labor	3	0	0
skills	1	2	2
know-how	1	1	2
market	3	9	5
socio-political	0	0	0
competition	1	0	0
owner	5	0	0
opportunity	1	0	0
none	0	3	2
total in Belgium	**15**	**15**	**11**
total in Belgium	**25,4%**	**25,4%**	**13,3%**

Table 6 Evolution of location advantage in Belgium since 1995

primary advantage 1995	gone	survived	total
skills	0	2	2
know-how	0	1	1
market	4	5	9
none	2	1	3
total	**6**	**9**	**15**

Table 7 History of location advantage in Belgium in 2005

primary advantage 2005	new	survived	total
skills	0	2	2
know-how	1	1	2
market	2	3	5
none	0	2	2
total	**3**	**8**	**11**

Figure 17 links this discussion to Ferdows' framework of the strategic role of the plant. We see that of the plants with market proximity as location advantage the ones that have disappeared range from a low to a high level of strategic role. This implies that a high level of strategic role is no guarantee for survival of the plant.

Figure 17 Evolution of strategic role of plants in Belgium since 1995

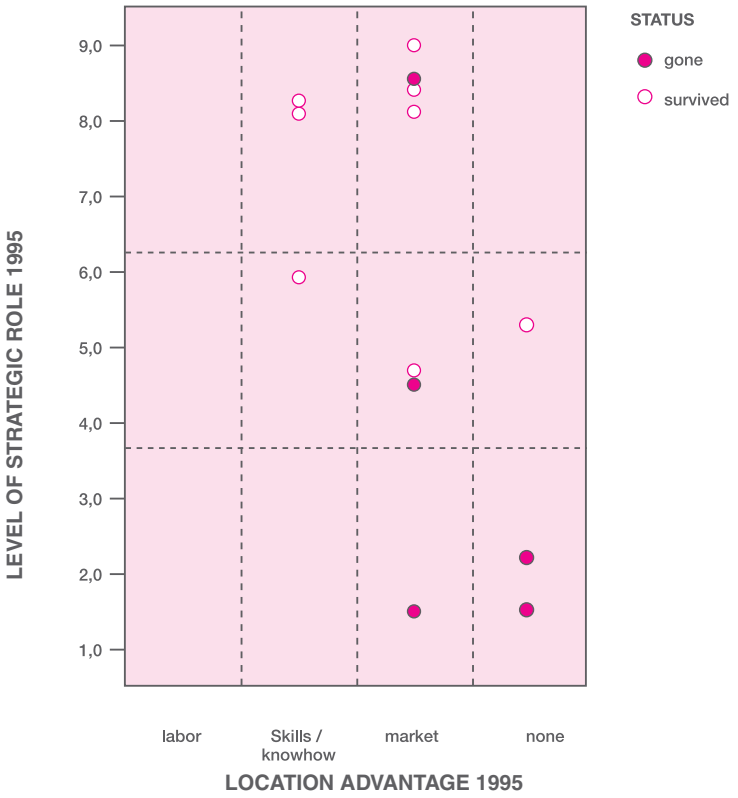


Figure 18 shows the evolution of these plants in relation to their network position. We see that all hosting network players and one of the two active network players have survived over time.
We all know that in our region with high labor cost the closure of plants is a real risk. Our study shows that network players (and especially hosting network players) seem to have the most stable future perspectives. Yet, as we can see in Figure 19, Table 8 and Table 9, not all of the plants in our country play a networking role. If we want our manufacturing plants to survive in Belgium, we will have to work on building their network relations with other plants in the network.
However, we will need to acknowledge that building network relations takes time; the network position of a plant develops over time. Whether we will be granted this time for the Belgian plants remains to be seen.

Figure 18 Evolution of network position of plants in Belgium since 1995

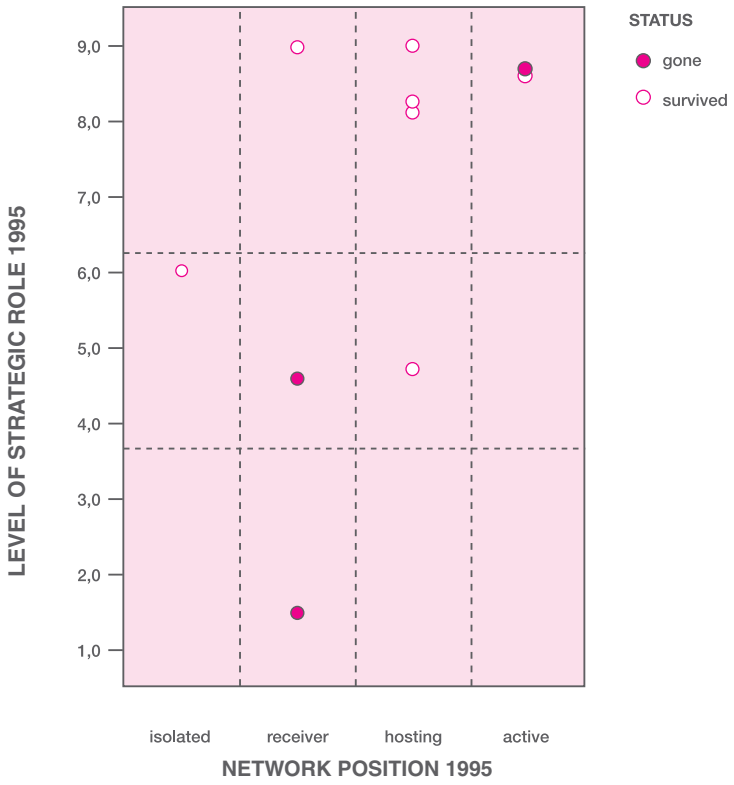


Figure 19 History of network position of plants in Belgium in 2005

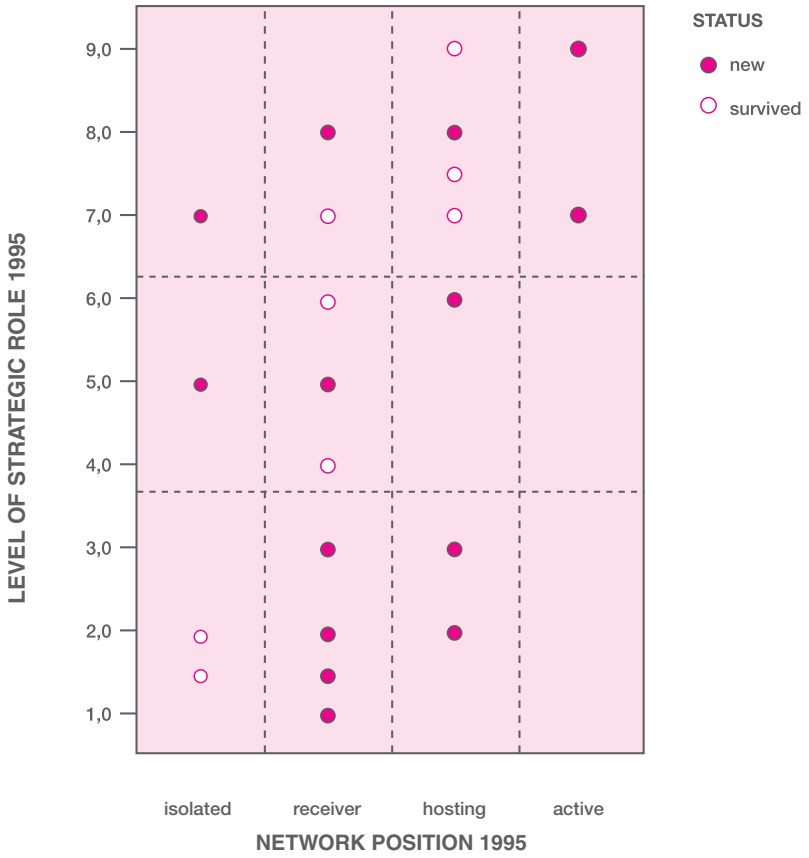


Table 8 Evolution of network position in Belgium since 1995

network position 1995	gone	survived	total
isolated	0	1	1
receiver	3	2	5
hosting	0	5	5
active	1	1	2
total	**6**	**9**	**15**

Table 9 History of network position in Belgium in 2005

network position 2005	new	survived	total
isolated	1	0	1
receiver	1	1	2
hosting	0	5	5
active	1	3	4
total	**3**	**9**	**12**

Also, when considered from the perspective of headquarters, it may well make sense to keep some of the plants in an isolated or receiver role, in order to control the complexity of networks and to maintain a degree of flexibility. So, there may be good reasons (for headquarters) not to invest in the building of network relationships in the manufacturing network. Networks need to be agile and need to adjust as the environment changes. As discussed earlier, isolated and receiver plants are more “mobile” plants, that offer this degree of flexibility. So the opinion on what needs to be done for the Belgian plants may be different for the Belgian plant managers, who want to safe their plant, than it is for the multinational headquarters, who want to optimize the network.

SUMMARY AND CONCLUSIONS

This chapter summarizes the main conclusions of the research.

- 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.

- 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.

- Many interviewees have stressed the importance of networking, and report that, compared to ten years ago, the exchange of know-how between their plants has increased. We have indications that the proportion of network players has increased, although this should be confirmed through more in-depth and analytical case research.

- It is interesting to study which plants have disappeared from the networks. Some patterns arise from the data:
  - Some location advantages seem to be more stable than others: The availability of skills, know-how and market proximity are stable location advantages, while the availability of low labor cost 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 network position of plants has some predictive value. Several of the isolated and receiver plants have disappeared over the past ten years, whereas none of the hosting network players, and only one of the active network players have disappeared. Our conclusion is that network players have a more stable future than the isolated and the receiver plants.

- Some of the Belgian plants have made space for plants abroad in the networks. The ones that remain in Belgium (and the very few that have been introduced in the networks) are here because of the availability of skills and know-how, or because of market proximity. As we have seen, these are stable location advantages. However, it should be noted that for two of the Belgian plants, no major location advantage has been mentioned, which puts a serious burden on the plant.

- Not all of the plants in our country play a networking role. If we want our manufacturing plants to survive in Belgium, we will have to work on building their network relations with other plants in the network. However, building network relations takes time.

RECOMMENDATIONS FOR PRACTITIONERS AND POLICY MAKERS

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***, overviewing 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.
Some location advantages are more stable than others. 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 of the plant, but which allow the plant to grow in the future. For example, plants which are exploited for reasons of tax incentives or low labor cost today, may want to build on skills or market growth for the future.
Even more important is that, as know-how develops in the plant, the plant manager should offer this know-how to the other plants in the network. A defensive strategy, protecting the know-how in the plant, and keeping it in-house, may pay off in the short term, since it will help the plant improve its performance relative to the other plants. However, in the long term, it may have an adverse effect. It will bring the factory in an isolated position. This will constrain the flows of knowledge the factory may expect to receive in the future, and as such may in the long term reduce the innovative power of the factory. But even worse, it will change the role the factory plays in the network. If sooner or later the company needs to reduce capacity, this factory will be an easy victim. By downsizing this factory, the company will have accomplished its objective to reduce capacity, without hurting the knowledge flows in the network. At the end of the trip, an attempt to protect the factory may well have turned into a scenario of making the factory abundant. Our research findings therefore include a warning signal for the plant manager, especially in those factories located in high labor cost countries.

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 the design and management of the flows of innovation and know-how. One may leave this to chance; but one may also see this as a strategic decision. Facilitating, building and maintaining network relations among plants creates flows of innovation, which may be key to competitiveness. However, this takes time and it requires a willingness to share know-how. Headquarters play an important role in creating the right culture for this openness, and in offering systems to support the network relations.
Yet, at the same time, companies may need some isolated or receiver plants, since they are an "easy" add-on to a network; they offer ***strategic flexibility*** to networks that are in expansion. This expansion is an important element in the development of "our" Belgian multinationals, since it puts them on the map of the true global players. By adding plants to the network in distant locations, our multinationals can tap into growing markets. Initially for the volume and return they offer; gradually for the know-how that is available in these markets. This probably means that these isolated or receiver plants will gradually evolve into network players.

This brings us finally to the discussion on ***delocalization***. While strategically important to safeguard and improve the competitiveness of the multinational, it is often perceived as unavoidable and yet unfair at the level of the factory. It is our belief that indeed it is unavoidable for some of the isolated and receiving factories in high labor cost countries. Consequently, these factories may protect themselves, not by complaining when it is too late, but rather by anticipating through building network relationships. This takes time, it requires careful strategic planning, and the willingness of headquarters to invest in these network relationships. Network players on the other hand should understand the importance of their role in the network, and should keep on investing in their own innovation capability, as well as in the transfer of their knowledge to the other players in the network. While sharing their knowledge may seem too generous in the short term, it is precisely their reason for existence, and their guarantee for survival in the long term.

Policy makers play an important role in this debate. It is our conviction that a lot of attention, rightly so, has been put on the importance of innovation in our factories. Policy makers have stimulated innovativeness in our country, through awareness creation and support.
We would like to add to this debate the importance of sharing this innovation with others. Our study shows that innovativeness is an important but not sufficient element for a sustainable future of manufacturing in Belgium. Our plants should be stimulated and supported to become true network players, acting as sources of know-how for the other plants in the multinational. This will make them a spot in the network that is crucial for the future of the multinational company.

There is no time to waste. In our study, we have encountered plants in low-labor cost countries that are innovative and that start acting as centers of excellence, developing know-how to the benefit of the other plants in the network. We should not stay behind!

REFERENCES

FERDOWS, K. (1997). "Making the most of foreign factories." *Harvard Business Review* Vol 75 No 2: 73-88.

VEREECKE, A. and A. DE MEYER (2006). Do not forget the strategic architecture of your manufacturing network while offshoring, Vlerick Leuven Gent Management School, working paper.

VEREECKE, A. and S. MUYLLE (2006). "Performance improvement through supply chain collaboration in Europe." *International Journal of Operations and Production Management* Vol 26 No 11: 1176-1198.

VEREECKE, A. and R. VAN DIERDONCK (2002). "The strategic role of the plant: testing Ferdows' model." *International Journal of Operations and Production Management* Vol 22 No 5: 492-514.

VEREECKE, A., R. VAN DIERDONCK and A. DE MEYER (2006). "A typology of plants in global manufacturing networks." *Management Science* Vol 52 No 11: 1737-1750.

EXHIBIT 1

Exhibit 1 Potential drivers for establishing/exploiting a plant

Proximity to suppliers
- to benefit from rapid/reliable delivery from suppliers and/or low transport costs
- to be close to low cost suppliers
- to facilitate cooperation with suppliers in product design, planning, etc.
- to have access to source of raw materials

Availability of labor
- to take advantage of low-cost labor
- to take advantage of the availability of workers
- to take advantage of favorable social climate (high productivity, low absenteeism rate, weak unionization, etc.)

Availability of skills and know-how
- to take advantage of highly qualified workers
- to take advantage of skilled engineers
- to take advantage of managerial/organizational skills
- to be close to the source of technological know-how (university, research institute, etc.)

Proximity to market
- to provide rapid/reliable delivery to customers, at low transport costs
- to adapt products to local taste and/or to facilitate co-operation with customers in product design, planning, etc.
- to provide fast service or technical support to customers

Socio-Political
- to benefit from tax breaks and/or investment incentives
- to overcome trade barriers
- to benefit from favorable or less stringent environmental regulations
- to reduce the impact of exchange rate fluctuations

Competition
- to be close to major competitors
- to prevent major competitors from establishing a manufacturing facility in the area
- to capture/maintain market share

Energy
- to take advantage of low-cost energy

Other
- to take advantage of highly qualitative environment (air, water, noise, climate)
- to create a high quality of life for employees
- the place of residence of the owner
- to seize a provided opportunity

FLANDERS DC
INSPIRING CREATIVITY

Knowledge partner

Vlerick Leuven Gent
Management School

the Autonomous Management School of
Ghent University and Katholieke Universiteit Leuven

ISBN-NUMMER : 9789078858065