

**GLOBAL PLANT NETWORKS IN
EUROPEAN MULTINATIONALS**

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ABSTRACT

This paper discusses the network of manufacturing facilities in European multinationals on the basis of the “European Manufacturing Futures Survey”. It is shown that proximity to the market and low-cost labor are the main drivers for establishing a plant abroad, and that access to high quality input factors is the main differentiator in the decision to manufacture abroad. The results indicate that manufacturing companies consider proximity to the market as a logistical advantage, much more than an opportunity for tailoring their products to their markets. Companies that emphasize product leadership attach much importance to the availability of qualified labor in the design of their plant network. Finally, the importance of managing the plant configuration as a tight network of plants is highlighted.

INTRODUCTION

It is commonly accepted today in the international strategy literature that companies are faced with a growing complexity of their businesses. Whereas traditionally companies had to respond to pressures for global integration or to pressures for local differentiation, increasingly now they have to respond to both (Bartlett and Ghoshal, 1989). Consequently, we see today that many multinational companies develop capabilities to respond to the diversity in national or regional demands, while at the same time they integrate and coordinate their activities globally to reduce costs and improve productivity. These changes have forced multinational companies to rethink their global strategy in general, and to rethink their manufacturing strategy more specifically. Designing a global manufacturing strategy is not an easy task, as there are no straightforward answers that fit any business context. At the same time, however, it is a critical task (Klassen and Whybark, 1993).

This paper deals with one particular aspect of the global manufacturing strategy of multinational companies, namely the global plant configuration. More specifically, the paper discusses two research questions. Firstly, what drives managers to establish a production plant abroad ? Secondly, how and to what extent does the international plant network of a company support the core capabilities ?

The analyses in this paper are based on the data collected through the 1994 version of the "European Manufacturing Futures Survey"¹. A total of 164 responses were collected, from companies headquartered in Europe. The analyses reported in this paper are based on the 90 respondents that reported to have international manufacturing facilities.

DRIVERS FOR ESTABLISHING MANUFACTURING FACILITIES ABROAD

There are multiple factors that may drive a company to establish a plant in a foreign country : labor cost and labor availability, cost and availability of supplies, access to the market, access to know-how, government incentives and tax breaks, and expatriate issues. (See for example Ferdows, 1989; Porter, 1990)

¹ The Manufacturing Futures Survey was organized for the first time by J.G. Miller at Boston University in 1981. Since 1983 it has been administered at INSEAD (Europe) and Waseda University (Japan). Currently, it is administered in 18 countries, including the original countries, as well as Korea, Australia, Canada, South-Africa, New Zealand, Mexico, Taiwan, Singapore and China.

A list of 12 possible reasons for establishing foreign manufacturing facilities was included in the questionnaire. On a 7-point Likert scale, the respondents have indicated how important each of these reasons is, at present, for their business unit and how important they expect them to be 5 years from now.

Results

In table 1 we provide the degree of importance of each reason, in descending order of importance. Pairwise comparison of the means of the 12 'At present' variables reveals that three groups of drivers can be distinguished with approximately equal average importance² within the groups. The same observation holds for the '5 years from now' variables.

Proximity to the major customers, both in terms of physical closeness and of being able to provide fast service and support, appears to be the main driver for establishing foreign manufacturing facilities. It is expected that these reasons will remain highly important in the near future. Third in the ranking, at present and in the near future, is the access to low-cost labor. Of moderate importance are the drivers that relate to social/political and fiscal/financial incentives, the availability of qualified labor, and the proximity of suppliers (both low-cost and reliable / high-quality suppliers). Proximity to the source of raw materials or technological know-how appear to be less important. Proximity to competitors, and the creation of a high quality of life for the employees are also ranked low.

The ranking of the drivers is expected to change only marginally over the next 5 years (Spearman correlation coefficient for the ranking 'At present' and '5 years from now': 0.8951; $p=0.0001$). Moreover, the drivers are not expected to shift from one group to another. We therefore conclude that no significant change in relative importance is expected for these drivers over the next five years.

² The hypothesis H_0 of equal means can not be rejected at the 5% level, except for 'to be close to low-cost suppliers' (at present), which comes close on average to 'to be close to reliable / high-quality suppliers' and 'to take advantage of highly qualified labor', but not to the other 2 variables in the group. Similarly, 'to be close to reliable / high-quality suppliers' (5 years from now) comes close to all variables in its group, except for 'to take advantage of highly qualified labor'.

Table 1 Importance of reasons for establishing foreign manufacturing facilities

	At present	mean	5 years from now	mean ¹
<i>High Importance</i>	to be close to major customers	4.49	to provide fast service or technical support to major customers	4.60
	to provide fast service or technical support to major customers	4.46	to be close to major customers	4.29
	to take advantage of low-cost labor	4.03	to take advantage of low-cost labor	4.14
<i>Moderate Importance</i>	to take advantage of favorable social/political environment	3.44	to take advantage of highly qualified labor	3.46
	to benefit from tax breaks and/or investment incentives	3.43	to benefit from tax breaks and/or investment incentives	3.24
	to take advantage of highly qualified labor	3.38	to be close to low-cost suppliers	3.22
	to be close to reliable / high-quality suppliers	3.02	to take advantage of favorable social/political environment	3.22
	to be close to low-cost suppliers	2.94	to be close to reliable / high-quality suppliers	2.99
<i>Low Importance</i>	to be close to source of raw material	2.57	to create a high quality of life for employees	2.64
	to create a high quality of life for employees	2.44	to be close to the source of technological know-how (university, research institute, etc.)	2.43
	to be close to major competitors	2.40	to be close to source of raw material	2.38
	to be close to the source of technological know-how (university, research institute, etc.)	2.31	to be close to major competitors	2.34

¹ The data shows an increase of the overall mean between 'At present' and '5 years from now' (from 3.24 to 3.56). To allow for comparison of the two sets of data, this difference has been subtracted from the data '5 years from now'.

It is expected that only three drivers will change in absolute level of importance over the next 5 years. Being close to low-cost suppliers is expected to increase in importance over the next five years (H_0 of no change rejected at 5% level). Similarly, being close to the source of raw materials and taking advantage of favorable social/political environment is expected to decrease in importance (H_0 of no change rejected at 1% level).

Factor analysis of the drivers for establishing a plant abroad shows four factors with eigenvalue > 1 (principal components factor method, followed by varimax rotation). These 4 factors explain 71% of the variance. Table 2 shows the rotated factor patterns.

Table 2

Rotated factor patterns

Driver	Factor 1	Factor 2	Factor 3	Factor 4
technological know-how	0.84	0.06	-0.03	0.05
quality of life	0.84	0.12	0.15	0.17
qualified labor	0.72	0.20	0.34	0.13
reliable suppliers	0.66	0.55	0.05	-0.01
raw material	0.10	0.85	0.02	0.15
low cost suppliers	0.16	0.80	0.26	-0.09
tax & investment incentives	0.23	0.04	0.81	0.03
low cost labor	-0.13	0.35	0.74	0.04
social/political environment	0.49	-0.06	0.63	0.26
fast service	-0.00	0.06	-0.06	0.89
close to customers	0.17	-0.04	0.24	0.74
close to competitors	0.27	0.45	0.07	0.49

The first factor (explaining 35.4% of variance), which could be labeled "*quality of input factors*", is built by 4 drivers:

- to create a high quality of life for employees
- to be close to the source of technological know-how (university, research institute, etc.)
- to take advantage of highly qualified labor
- to be close to reliable / high-quality suppliers

The second factor (explaining 12.7% of variance) is related to the "*availability of supply*", and consists of the drivers:

- to be close to source of raw material
- to be close to low-cost suppliers
- (• to be close to reliable / high-quality suppliers)

The third factor (explaining 11.6% of variance) is labeled the "*social and financial incentives*", and consists of the drivers:

- to benefit from tax breaks and/or investment incentives
- to take advantage of low-cost labor
- to take advantage of favorable social/political environment

The fourth factor (explaining 10.9% of variance) is *the "closeness to the market and the competition"*, and consists of the drivers:

- to provide fast service or technical support to major customers
- to be close to major customers
- to be close to major competitors

The drivers '5 years from now' show a very different pattern of (meaningless) factors.

Discussion

Market accessibility, both in terms of being close to your customers for logistical reasons, and for providing service and support, are (and remain) the most important reason for establishing a plant, followed closely by the advantage of manufacturing in cheap labor countries.

The possibility to tap into local know-how by locating a plant in the neighborhood of a university, a research institute, etc. is ranked very low. We should note, however, that the importance reported here is an average score, over the sample of respondents, and for all the plants in the company of each respondent. Unfortunately, the data does not allow us to measure the importance of the location drivers for each individual plant within the companies represented in the sample. Previous case research has convinced us that at the level of the individual plant technological know-how may well be the main driver for establishing the plant, thus assigning the role of "lead plant" to this plant, as described by Ferdows (1989).

In general, companies attach little importance to following competition in setting up an international configuration of plants.

Factor analysis reveals that four sets of drivers guide the managers in the establishment of a global plant configuration : the quality of the input factors, the availability of supply, social and financial incentives, and closeness to the market and to competition. The decision criterion that explains most of the variance is the quality of input factors. This result indicates that, whereas the main criterion to go abroad with manufacturing is the market, the criterion that differentiates companies most is the quality of input factors.

When analyzing the importance of the drivers expected in the near future, we find factors that are less straightforward. A possible explanation is that managers do indeed employ the four

factors for explaining the rationale behind their existing plant configuration. However, when asked about the benefits that can be gained from the plant network in the near future, their thoughts probably are more subtle and differentiated.

GLOBAL PLANT NETWORK AND CORE CAPABILITIES

It is the objective of the manufacturing strategy in general to support the competitive strategy of the company. This paper focuses on one particular aspect of the manufacturing strategy, the plant configuration, and investigates to what extent and in what way it supports the core capabilities of the multinational company. Three “core capabilities” have been identified in the survey, very much in line with the “value disciplines” as described by Treacy and Wiersema (1995):

“operational excellence”, defined as the capability to deliver reliable products, at competitive price with high dependability

“customer intimacy”, defined as the capability to tailor products to match exactly the requirements of the selected market

“product leadership”, defined as the capability to offer products with leading edge technologies that consistently exceed customer’s expectations

Results

For each of these capabilities, the respondents were asked to indicate (on a 7 point Likert scale) the importance attached to it. A correlation analysis between each of the factors driving the establishment of foreign plants, and each of the core capabilities, showed significance (at the 10% level) on only 2 pairs of variables:

“closeness to the market and to competition” is correlated with operational excellence ($R^2 = 0.19$).

“social and financial incentives” is correlated with product leadership ($R^2 = 0.20$)

When looking at the more detailed data, by correlating each of the drivers individually with each of the core capabilities, more relationships become apparent. Table 3 summarizes the significant relationships that have been found.

Table 3

Correlation analysis: significant relationships

Driver for establishing foreign plant	Sign of relationship (significance level)	Core capability
to be close to major customers	positive (10%)	operational excellence
to be close to major customers	negative (5%)	customer intimacy
to be close to source of raw material	negative (5%)	customer intimacy
to take advantage of favorable social / political environment	positive (10%)	product leadership
to benefit from tax breaks and /or investment incentives	positive (10%)	product leadership
to take advantage of highly qualified labor	positive (10%)	product leadership

Discussion

We observe few significant relationships between the plant location drivers and the core capabilities. This may be because the design of the plant configuration is not a major factor in building capabilities. Or it may be that managers tend to underestimate the strength of their plant configuration in the competitive marketplace.

Locating a plant close to its market is seen basically as a logistical advantage, that allows the company to obtain operational excellence (Table 3).

Proximity to the market clearly does not lead to the capability to respond to the customers in terms of tailoring the products to the market. The data does not show any driver that is positively related to building this capability. This suggests that the manufacturing function is not the main driver in the company behind this capability. The main question is probably not where the product gets produced, but much more how market information is collected, and how it is transferred to the facility that designs and produces the product.

As was expected, the capability to offer products with leading-edge technology is sustained by having manufacturing facilities in areas with highly qualified labor. Surprisingly, no relationship is shown between this capability and the location of manufacturing facilities close to centers of know-how, such as research institutes or universities. The same explanation as

with the responsiveness to the market may be valid here: It may be that the physical presence, by having a local plant, is not a prerequisite for tapping into technology and know-how. The rapid evolution in IT and telecommunication is undoubtedly an important factor in this respect.

Against our hypotheses, we observe that there is a relationship between product leadership and the advantage offered by a favorable social/political environment, tax breaks and financial incentives. At this stage of the research, we see no explanation for this relationship.

THE IMPORTANCE OF NETWORKING

The relationships discussed in the previous section provide evidence that the design of the plant configuration explains only to a limited extent the core capabilities. In this final section, we investigate to what extent the way the international operations are managed is seen as a source of capabilities. More specifically, we have investigated the importance of managing the production systems of the foreign plants in an integrated way.

Results

How the international operations are managed has been measured by a variable "NETWORKING", operationalized by a 7 point Likert scale, indicating at the one extreme, a plant configuration managed as a set of completely independent regional plants; at the other extreme, it indicates a plant configuration managed as a fully integrated network of plants.

Linear regression of the networking variable with the three core capabilities gives an $R^2 = 0.11$, with significance of 0.02 :

$$\begin{aligned} \text{NETWORKING} &= 0.15 + 0.07 * \text{Operational excellence} \\ &+ 0.36 * \text{Customer intimacy } \dagger \\ &+ 0.28 * \text{Product leadership } \dagger \end{aligned}$$

(\dagger significant at 5% level)

Discussion

As was expected on the basis of the previous discussion, companies pursuing “customer intimacy” or “product leadership” tend to rely on integration and networking of their manufacturing facilities.

CONCLUSION

In this paper we have shown that the main purpose of internationalization in manufacturing - for European manufacturers- is to be close to the market. The results of the research indicate that the major advantage companies gain from producing close to their market is a logistical advantage, rather than the opportunity to tap into market data or to tailor products to market needs. The biggest differentiator in the decision to manufacture abroad is the access to high quality input factors, of all kinds (labor, know-how, supplies).

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