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Manuskripte
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Nr. 537

**A REEXAMINATION AND EXTENSION
OF INTERNATIONAL
STRATEGY-STRUCTURE THEORY**

Joachim Wolf / William G. Egelhoff



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ABSTRACT

Using a sample of 95 German firms, the study finds general support for the traditional fits of international strategy-structure theory. Employing an information-processing perspective, the study conceptually and empirically extends existing theory (1) to address strategy-structure fit for various types of matrix structure, and (2) by adding two new elements of international strategy to the existing international strategy-structure model: the level of international transfers and level of foreign R&D.

In the 1970s and 1980s a number of strategy-structure fits were discovered, conceptualized, and used to model the relationship between MNC strategy and MNC organizational design (Stopford and Wells, 1972; Franko, 1976; Daniels, Pitts and Tretter, 1984, 1985; Egelhoff, 1982, 1988a). The primary advantages associated with such strategy-structure models of the MNC include (1) a clear specification of when one type of structure is superior to another, and (2) the identification of those elements of strategy which are most important to a firm's structure. These characteristics made strategy-structure models attractive guidelines for evaluating and designing a firm's structure and considering the organizational implications of changes in firm strategy. While such models are frequently used for teaching purposes, most of the underlying theory has not been retested or updated for at least a decade. Over this period, substantial change has occurred in both international strategies and organizational designs, and there has been a growing interest in non-structural approaches to organizing international firms (Bartlett and Ghoshal, 1989; Hedlund, 1993). As a result of such change, there is a need to retest and extend strategy-structure theory to better reflect both the globalization of international strategy and the use of a wider array of structures by MNCs (60% of the study's sample companies use a type of structure not directly addressed by traditional strategy-structure theory).

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

The seminal study of Stopford and Wells (1972) is still the cornerstone of most discussions about the strategy and structure of MNCs. According to the Stopford and Wells Model, an MNC's organizational structure needs to fit two important aspects of international strategy: the relative size of foreign sales and the degree of foreign product diversity. The interaction of these two contingency variables specifies four different strategic domains, each of which is associated with a different type of structure. Low foreign sales and low foreign product diversity is associated with an international division structure, low foreign sales and high product diversity with a worldwide product division structure, high foreign sales and low foreign product diversity with a geographical region structure, and, more tentatively, high foreign sales and high foreign product diversity with matrix or mixed structures.

Subsequent studies have largely confirmed and in some cases extended the Stopford and Wells Model (Franko, 1976; Davidson and Haspeslagh, 1982; Daniels, Pitts, and Tretter, 1984, 1985). Egelhoff (1982, 1988a) extended the Stopford and Wells Model by (1) identifying the critical strategic fits for a worldwide functional division structure, and (2) establishing the importance of foreign manufacturing as a new element of strategy. Traditional theory, however, deals largely with the fit between strategy and the four types of elementary structure. Most importantly, it does not address the many types of matrix structure which frequently appear in today's MNCs, and it is here that the present study seeks to extend theory.

While most strategy-structure theory has been empirically derived, some studies have used an information-processing perspective to conceptualize the relationship between strategy and structure (Egelhoff, 1982; Habib and Victor, 1991). Here the organization is viewed as an information-processing system, where each type of structure facilitates certain types of information processing between the subunits of an organization, while at the same time it

restricts other types of information processing. By describing strategies in terms of the kind and amount of information processing required to implement them, one can create a general framework for hypothesizing fit or congruence between structure and strategy. This model has been described in considerable detail in Egelhoff (1982), and the present study employs this framework.

AN INFORMATION-PROCESSING MODEL OF STRATEGY AND STRUCTURE

The four elementary types of structure commonly used by MNCs are worldwide functional divisions, international divisions, geographical regions, and worldwide product divisions. These basic structures also become the building blocks for more complex structures (matrix and mixed structures). The general information-processing model uses relative organizational distance (or closeness) through the formal organization structure to define where communication will be facilitated and where it will be hindered between organizational subunits. In addition to organizational distance (which specifies which subunits are interconnected), structure also influences what type of information (in terms of subject and perspective) can be processed between interconnected subunits. Horizontal differentiation (or specialization) largely determines in which subunits certain types of knowledge reside, just as vertical differentiation largely determines at what levels tactical and strategic perspectives of the business can be taken. How parent headquarters are differentiated (functions, products, geographical regions) and which subunits are directly linked through the hierarchy largely determines what types of information processing a structure will provide.

Egelhoff (1988b) suggests that the above framework can also be extended to matrix structures. He argues that a matrix structure combines in an additive manner the individual information-processing capacities of the elementary structural dimensions that comprise the

matrix. This idea, however, has only been tested with a small sample (Egelhoff's study contained only 7 matrix firms and 4 types of matrix structure). The present study seeks to more extensively test and develop this idea, by grouping structures that contain a given structural dimension, and then evaluating whether the hypothesized fit applies to the group. Thus, the unit of analysis becomes a structural dimension, rather than a specific type of structure. The view that a matrix structure provides not just multiple dimensions of information processing within an organization, but, more specifically, the information-processing capacities of the two or three elementary dimensions represented in the matrix is potentially a powerful idea. Matrix structures tend to evolve when a second elementary dimension is added to an existing elementary structure. This increases the number of strategy-structure fits that a structure can support, although there is the added cost of maintaining two separate hierarchies within an organization. This information-processing perspective of matrix structures provides valuable insight into how they function and clearly distinguishes how one type of matrix differs from another.

Next we want to discuss the information-processing requirements of the five strategy variables employed by the study and use these requirements to deduce hypotheses linking strategy to structure. Three of these variables are traditional measures of international strategy (foreign product diversity, size of foreign operations, and size of foreign manufacturing). Here, logic and empirical findings already exist for specifying strategy-structure relationships. The remaining two variables measure foreign R&D as a percentage of total R&D and intracompany transfers between the German parent and its foreign subsidiaries as a percentage of total sales. These new variables capture two of the more important new trends in international strategy: the international dispersion of technology development and more global sourcing patterns. For these, new hypotheses will have to be developed, based on available knowledge.

Foreign Product Diversity

II of the above studies confirm the importance of product diversity to the choice of appropriate macro structure. As product diversity increases, there is an increase in both market diversity (environmental complexity) and manufacturing and technical diversity (technological complexity). As environmental and technological complexity increase, requirements for information processing between interdependent subunits also increase. There is a greater need for tactical and strategic information processing for product matters, since there will be more technical operating problems and a greater number of strategic product decisions. There is no associated increase in the complexity of nonproduct matters. The structure providing the most product-related information-processing capacity between the centers of product knowledge in the parent and the foreign subsidiaries is the worldwide product division structure. It utilizes several separate information-processing channels between a subsidiary and the parent, one for each product division in the subsidiary. This leads to the following hypothesis:

Hypothesis 1 *Firms with a product division dimension in their structures will tend to have more foreign product diversity than firms without such a dimension.*

Size of Foreign Operations

Along with foreign product diversity, size of foreign operations (as a percentage of total company operations) was one of the two key contingency variables of the Stopford and Wells (1972) Model. Its importance was later confirmed by other studies. The dominant relationship here is that relatively small foreign operations are associated with international division structures. The logic is that an international division structure concentrates the limited international expertise of a firm in one division so that it can attain a critical mass and level of specialization that can then be efficiently focused on a relatively small set of foreign operations. Since it hinders information processing and synergy between international and domestic

operations, this loss is most acceptable when foreign operations are small.

Hypothesis 2 Firms with an international division dimension in their structures will tend to have a lower percentage of foreign sales than firms with other structures.

Size of Foreign Manufacturing

Size of foreign manufacturing was established by Egelhoff (1988a) as an important discriminator between firms with geographical region structures and firms with worldwide product division structures. The logic is that geographical region structures largely provide good coordination within a region (and poor coordination between regions), and such coordination is primarily required to optimize regional sourcing strategies. Regional product development and sourcing can only develop after there is sufficient foreign manufacturing to largely supply foreign sales from foreign manufacturing. If foreign sales are largely supplied from the parent, there is less need for coordination within regions and more need for coordination between the parent and each foreign operation. This latter situation is better served by the information-processing capabilities of a worldwide product division structure than by those of a geographical region structure. An interesting issue is whether regional strategies and sourcing patterns are still intact today, or whether they are being replaced by global sourcing patterns? If recent data show high levels of foreign manufacturing associated with worldwide product division structures (rather than geographical region structures), this would indicate a shift from regional to global strategies.

Hypothesis 3 Firms with a geographical region dimension in their structure will tend to have higher levels of foreign manufacturing than firms without such a dimension.

Intracompany Transfers

The literature dealing with international strategy suggests that intracompany transfers are growing, as firms seek to optimize sourcing strategies in terms of locational advantages and economies of scale (Porter, 1986; Bartlett and Ghoshal, 1989; Kogut, 1994). The information-processing capacities of the worldwide functional and product division structures clearly facilitate implementing a global sourcing strategy, with high levels of intracompany transfers. The first provides global coordination across all manufacturing operations within a company. The second provides global coordination across all manufacturing operations within a product or business area. Both can optimize on a global basis. In contrast, the geographical region structure only supports intracompany transfers within regions, while the international division structure only supports low levels of intracompany transfer. A full assessment of this logic would require a complete set of data on intracompany transfers at the subsidiary level. The present study has measured total intracompany transfers into and out of the parent company. Consistent with this level of data, the following hypothesis tests a part of the above conceptualization:

Hypothesis 4 Firms with a worldwide functional division dimension or a worldwide product division dimension in their structures will tend to have higher levels of intracompany transfer than firms without such dimensions.

Size of Foreign R&D

The international diffusion of R&D activity within a company has at least two structural implications. First, research indicates that international technology development tends to follow manufacturing abroad (Ronstadt, 1977; Behrman and Fischer, 1980). Over time, foreign plants frequently attempt to extend their initial manufacturing mandates to include: providing technical service, modifying products to fit local markets, and ultimately to developing new process and

product technology. This stages perspective of international R&D growth implies a strong link to the size and sophistication of foreign manufacturing, and Table 1 shows a strong correlation between the two (.68). The implication of this linkage is that higher levels of foreign R&D will also tend to be associated with the geographical region structure, since high levels of foreign manufacturing are associated with this structure.

Hypothesis 5 Firms with a geographical region dimension in their structures will tend to have higher levels of foreign R&D than firms without such a dimension.

While the above hypothesis reflects a causal rationale for the specified fit, it appears that more sophisticated types of foreign R&D are not well served by a geographical region structure.

Once R&D goes beyond providing technical service and adapting technology to fit local conditions, a more global and parent-oriented exchange of technical knowledge seems to be called for. The geographical region structure hinders this kind of knowledge flow, because it provides poor information processing between regions. Instead, a worldwide product division or worldwide functional division structure provides a more global and parent-oriented flow of information. This line of reasoning leads to the following hypothesis:

Hypothesis 5b Firms with a worldwide functional division or a worldwide product division dimension in their structures will tend to be associated with higher levels of foreign R&D than firms without such dimensions.

RESEARCH DESIGN

The research sample consists of 95 German manufacturing companies, each with foreign sales of 10% or more. The sample was taken from a wider study of strategy and structure in German firms, using the above criteria to select the sample. The wider study sample was chosen to represent all German firms. Industries included in the research sample

are: chemical, steel and nonferrous metals, machinery, automotive and transportation, electrical equipment, textile, and food products. Firm size varies from 43 million DM to 113 billion DM in annual sales, with a mean of 7.9 billion DM and standard deviation of 19.4 billion DM (U.S. \$ = 2.2 DM). In this respect, the sample differs significantly from previous strategy-structure studies, which typically represented large, Fortune 500 firms.

Data collection was by mail questionnaire. Measurement of organizational structure and the five elements of strategy are described in the Appendix. Table 1 shows the means, standard deviations, and correlations among the elements of strategy. Ten different types of structure were identified in the sample.

Table 1. Means, standard deviations and correlations of elements of strategy

Variable	Mean	S.D.	1.	2.	3.	4.
1. Product diversity	3.7	2.9				
2. Size of foreign operations	49.7	20.7	.14			
3. Size of foreign manufacturing	28.5	23.3	.10	.46***		
4. Intracompany transfers	27.6	25.2	-.07	.51***	.32**	
5. Size of foreign R&D	12.9	18.4	.12	.49***	.68***	.30**

***: $p < .001$; **: $p < .01$ (n = 70-94)

These are shown at the top of Table 2. Nineteen firms possess only a domestic structure, despite the fact that on average 35% of their sales are foreign. Under this structure, foreign operations report directly to the parent CEO. While this type of firm is an important component of German international business, it is largely absent from existing theory. As a result, our observations concerning this category will be largely exploratory.

Table 2. Hypotheses and results of ANOVA contrasts and t-tests

Number of firms	Mean Values of Elements of Strategy										Differences
	DS 19	FD 8	ID 7	GR 2	PD 19	FDxPD 6	FDxGR 5	PDxGR 5	Tensor 8	Mixed 16	
Hypotheses											
1. Product diversity greatest in structures with PD dimension.	2.2	2.3	3.3	3.0	6.1	3.5	2.4	5.4	2.4	4.2	(PD + FDxPD + PDxGR + Tensor) greater than (FD + ID + GR + FDxGR) at p < .01.
2. Size of foreign operations lowest in ID.	35	42	37*	58	56	55	59	67	60	53	* Different from PDxGR and Tensor at p < .01, and from PD, FDxPD, and FDxGR at p < .05.
3. Size of foreign manufacturing greatest in structures with GR dimension.	8.8	28	21	40	34	43	47	38	56	18	(GR + FDxGR + PDxGR + Tensor) greater than (FD + ID + PD + FDxPD) at p < .01.
4. Intra company transfers greatest in structures with FD and PD dimensions.	9.5	42	18	6.0	28	28	38	40	47	37	(FD + FDxPD + FDxGR + Tensor) greater than (ID + GR) at p < .01; (PD + FDxPD + PDxGR + Tensor) greater than (ID + GR) at p < .05.
5. Size of foreign R&D greatest in structures with GR dimension. Greatest in structures with FD and PD dimensions.	4.4	4.6	7.1	0	21	11	26	22	25	9.5	(GR + FDxGR + PDxGR + Tensor) greater than (FD + PD + ID + FDxPD) at p < .05; (FD + FDxPD + FDxGR + Tensor) greater than (GR + ID) at p < .10; (PD + FDxPD + PDxGR + Tensor) greater than (GR + ID) at p < .01.

Note: DS=Domestic structure; FD=Functional divisions; ID=International divisions; GR=Geographical regions; PD=Product divisions

It is also noteworthy that seven firms possess an international division structure, since previous studies had found very few German or continental European firms using this structure (Franko, 1976; Egelhoff, 1982). Only two firms use a geographical region structure, which is consistent with previous studies of European firms. Twenty-four firms use some kind of matrix structure (four different types of matrix appear). The „tensor“ structure is a uniquely German term, which defines a three-way matrix involving functional, geographical, and product division dimensions. While three-way matrix structures exist outside German companies, the significant number of such structures in the sample is interesting.

FINDINGS

Table 2 shows the mean values of the five elements of strategy by the ten different types of structure that appeared in the sample. ANOVA contrasts were used to determine the significance of differences between individual types of structure, while t-tests were used when the structures were combined into two groups. It is interesting that all of the traditional fits of the Stopford and Wells Model and Egelhoff's (1988a) modifications of the Model (involving product diversity, size of foreign operations, size of foreign manufacturing and the four elementary types of structure) were statistically significant in the sample data (with the exception of the two GR structures, which only directionally support the traditional fit). The focus of the present study and its hypotheses, however, is to extend these fits to include the structural dimensions that are combined in more complex matrix structures. This is accomplished by (1) combining structures into categories that contain or exclude a given structural dimension and (2) using these to conduct a broader statistical test of the impact of a given dimension (FD, GR, or PD) on strategy-structure fit.

Hypotheses 1 and 3, which implement this test, are both supported by the data. But equally important is the insight provided by a closer examination of the matrix category means

in Table 2. For product diversity the relevant means are PD=6.1, FDxPD=3.5, PDxGR=5.4, Tensor=2.4. These are all the structures which contain the PD dimension, and in Hypothesis 1 they collectively are associated with higher levels of product diversity than structures lacking a PD dimension. But while PD and PDxGR structures are associated with relatively high levels of product diversity, the FDxPD and tensor structures are not. Both of these structures contain a FD and a PD dimension. The former fits low product diversity, the latter high product diversity. When combined in a matrix, one of these conflicting fits must dominate. Our sample data suggest that the FD fit with product diversity dominates over the PD fit, when the two are combined in a matrix. Furthermore, there seems to be a strong logic for this dominance. Worldwide functional coordination across product divisions only makes sense when functions (like manufacturing) are sufficiently similar to make information sharing useful. Low product diversity helps to keep R&D, manufacturing, and marketing similar, so that global information processing along functional channels is useful. It is interesting to notice that in the third matrix structure (PDxGR), there is no conflict between the PD and GR dimensions when it comes to product diversity, and here the PD dimension's fit with high product diversity prevails, just as it does for the elementary product division structure. This analysis provides new insight into the interaction effects of the elementary dimensions when they are combined in a matrix structure.

For size of foreign manufacturing (Hypothesis 3), the relevant means are GR=40, FDxGR=47, PDxGR=38, Tensor=56. These are all the structures which contain the GR dimension, and in Hypothesis 3, they collectively are associated with higher levels of foreign manufacturing than structures lacking a GR dimension. Thus, the data suggest that most foreign manufacturing is still more associated with regional than global sourcing strategies, just as it was in Egelhoff's (1988a) study. Consistent with Hypothesis 2, international division structures tend to be associated with relatively small foreign operations. Within the framework of the first three strategy variables, it is also interesting to observe that the domestic structure firms

tend to have foreign sales and product diversity levels that are comparable to those of firms with international divisions, but their low level of foreign manufacturing (8.8%) largely differentiates the strategies of this category from the strategies of international division firms. For these domestic structure firms, foreign sales are significant, but they are largely supplied from parent country exports (a relatively simple international strategy).

The fourth and fifth elements of strategy and their hypotheses are new. The data generally support the hypothesis associated with intracompany transfers, which tend to be greatest in firms with worldwide functional division or worldwide product division dimensions in their structures. This supports the underlying logic that such global structures tend to be used to implement global sourcing strategies (with high levels of intracompany transfer between the parent country and the rest of the company), while international division and geographical region structures tend to fit more local or regional sourcing strategies (with lower levels of such transfer). While not hypothesized, it is interesting to notice the low level of transfer associated with the domestic structure companies. Low levels of both intracompany transfer and foreign manufacturing indicate that a high percentage of these firms' foreign sales are direct exports from the parent company to customers, without passing through foreign subsidiaries.

Hypotheses 5a and 5b were set up as alternative hypotheses, each with a different logic. Hypothesis 5a reasoned that the GR dimension would be most associated with high levels of foreign R&D, largely based on the evolutionary path that foreign R&D follows. Hypothesis 5b reasoned that global rather than regional information processing is required for more advanced stages of international R&D, and this requires an FD or PD dimension in the structure. While the data tend to support Hypothesis 5a (foreign R&D is greatest in structures with a GR dimension) it also reveals that foreign R&D is high in structures with a PD dimension. Thus, both logics for foreign R&D find support. Interestingly, the FD dimension is associated with lower levels of R&D. While the information-processing capacities of this dimension also favor

transferring new technology from the parent to foreign subsidiaries (as with the PD dimension), the concentration of R&D in the parent probably limits the company's ability to learn from reverse technology transfer (a significant difference from the PD dimension).

DISCUSSION AND CONCLUSIONS

The study suggests three important implications for managers and researchers:

1. The traditional fits of international strategy-structure theory still hold for MNCs today. Upon careful reflection, this is an interesting result. Despite recent changes in strategy and organizational design, the study shows that strategy-structure fit is not some past or vestigial property of firms - but an attribute that is currently being created by managers and selected by competitive environments.
2. The study further extends traditional theory by including two new elements of strategy, the level of intracompany transfers and size of foreign R&D. While the traditional elements of strategy-structure theory remain important, they miss much of the variety and richness that exists in today's international strategies. The level of intracompany transfers and size of foreign R&D capture new trends in sourcing strategies and the generation of knowledge.
3. The study extends traditional strategy-structure theory to better explain fit involving matrix structures. While traditional fits between elementary structures and strategies still hold, they don't directly address the structures employed by 60% of the sample companies. The primary category the study seeks to include under an extended theory is the matrix structure. The logic that a structural dimension (FD, GR, PD, ID) will possess similar information-processing capabilities if it is used as a stand-alone elementary structure or as a dimension in a matrix is fully described by Egelhoff (1988b). But to date, there has been no significant empirical testing of this logic. Most empirical studies have grouped matrix structures into a single category, which obscures their internal dimensions and their relationship to elementary structures. It is

important that the present study found statistically significant support for this logic.

This logic, however, is just a starting point for attempting to theorize and study how structural dimensions behave when they are combined in matrices. In one instance discovered during the analysis, the structural dimensions of a matrix (FDxPD) share conflicting fits with an element of strategy (product diversity). This kind of interdependency or interaction effect is absent from traditional strategy-structure theory, but becomes important when such theory is extended to matrices. The present study suggests that the FD fit with low product diversity dominates over the PD fit with high product diversity when the two are combined in a matrix (both the empirical data and information-processing logic support this particular interaction effect). As other elements of strategy and structural combinations occur (beyond those measured in the study) similar interaction effects (conflicts) may occur. Identifying where such conflicts exist and how they tend to be resolved is a key part of extending strategy-structure theory to matrix structures. Our study suggests that structural diversity in international firms may be increasing, as more types of structure appear in our sample than in earlier studies. But what is impressive is the robustness of traditional strategy-structure knowledge, even when it is applied to more complex structures.

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Appendix: Measurement of Variables

1. Organizational structure was measured by presenting respondents with descriptions and simplified organization charts of the various types of structure and asking them to select that which best describes their organization. This variable represents the operating structure, which can be different from the legal structure of MNCs.
2. Foreign product diversity was measured by the number of 5-digit product classes associated with the company (taken from the Hoppenstedt classification system). This measure of total company product diversity was used, because there is no official data available on a firm's foreign product diversity. It is reasonable to believe that foreign product diversity and total company product diversity are highly correlated in most German firms with foreign sales.
3. Size of foreign operations was measured by the percentage of a company's sales occurring outside of the parent country.
4. Size of foreign manufacturing was measured by the percentage of a company's manufacturing occurring outside of the parent country.
5. Intracompany transfers was measured by adding (1) the percentage of the parent country's procurement of final and intermediate products that are sourced from the company's foreign operations, to (2) the percentage of the parent company's sales which are transfers to the company's foreign operations.
6. Size of foreign R&D was measured by the percentage of the company's R&D employees working outside of the parent country.