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Interfirm Adaptation in Business Relationships

On the basis of social exchange theory and the resource-dependence model, a structural model of interfirm adaptation is formulated. The model accounts for mutual adaptation as a consequence of trust-building as well as for unilateral adaptation due to imbalanced dependence between the parties. The view that interfirm adaptations are elements in a social exchange process is supported.

IN business markets, suppliers and customers often develop lasting exchange relationships with each other (Arndt 1979; Carlton 1986; Gadde and Mattsson 1987; Hallén 1986; Wind 1970). Previous work has suggested that such business relationships should be considered as ongoing exchange processes (Dwyer, Schurr, and Oh 1987; Håkansson 1982; Håkansson and Östberg 1975; Turnbull and Valla 1986; Webster 1979).

Exchange is one of the core concepts in marketing theory (Bagozzi 1975; Kotler 1972), but exchange as a central feature in relationships is not exclusively a marketing theory conception. Sociologists, social psychologists, and social anthropologists have developed the concept of exchange in interpersonal relationships within a societal environment (Homans 1958; Thibault and Kelley 1959). Exchanges in social relationships are viewed as interaction processes where the interaction is any set of observable behavior on the part of at least two individuals when there is reason to believe that some parts of these individuals are responding to each other. This form of exchange process, in which two or more individuals simultaneously affect and are affected by each other in relatively enduring

ways, is also an adaptation process (Newcomb, Turner, and Converse 1952). If individuals are to interact for more than short periods, they must continue to adapt to each other's needs.

The marketing literature on exchange relationships points to the importance of exchange processes, yet studies on adaptations are lacking. With the exception of the International Marketing and Purchasing (IMP) study (Håkansson 1982; Turnbull and Valla 1986), the same is true in business marketing. Adaptations are, nevertheless, important aspects of interfirm exchange relationships, because most business relationships are based on some kind of match between the operations of two companies.

In this article, we analyze interfirm adaptation in business relationships. A discussion of adaptation, social exchange, and power dependence in business relationships leads up to the formulation of two propositions, which form the basis of a general structural model of adaptation in business relationships. A methodological section specifies the measurement of the concepts employed and the empirical basis of the subsequent analysis, which is performed by means of the LISREL method. We conclude with a discussion of the results and implications for research and management.

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Adaptation in Business Relationships

Adaptation

Adaptation is a concept with a long history in biology, referring to the ways in which fit is brought about

between living systems. Adaptation also has been used in human and cultural ecology (Hawley 1950, 1968; Steward 1968) to denote aspects of the interaction between social units and their environments. On the basis of cultural ecology, Alderson (1965) treats the adaptations that bring about balance between organized behavior systems and their environments as central elements in his functionalist theory of marketing. In these frameworks, however, many different kinds of adaptations are distinguished. In human ecology, symbiotic adaptations are singled out as adaptations taking place between two units or organisms that are dependent on each other. They are assumed to be important for the joint efficiency of the involved units (Hawley 1968).

In organization theory, where references to adaptations are frequent, two aspects have been stressed. The contingency theory focuses on the organization-environment interface (Lawrence and Lorsch 1967) and the behavioral theory emphasizes the dynamic or history-dependent aspects of adaptations and their role in organization change (Cyert and March 1963; March 1988).

The adaptation concept also has had an influence on thinking in business strategy. Strategic management has even been said to be the process of adapting to the changes in a firm's environment (Chakravarthy 1982; Schendel and Hofer 1979). In this tradition, much research aims at analyzing conditions for fit between a firm's capability and the needs of its customers (Ansoff 1979). Similarly, international marketing strategy research has focused on the issue of international standardization versus local adaptation of marketing programs (Buzzell 1968; Keegan 1969), implying that adaptation is not only a matter of general fit between the firm and its environment or market, but also a matter of specific fit in relation to different segments.

In business markets, where suppliers and customers often establish and develop lasting relationships with each other, and where the business in such relationships may account for considerable shares of the supplier's sales and/or the customer's needs, there is reason to expect that significant counterpart-specific, or symbiotic, adaptation occurs. Hence, one can expect that suppliers adapt to the needs of specific important customers as well as that customers adapt to the capabilities of specific suppliers. This adaptation is considered a central feature of working business relationships.

In addition, adaptation can be assumed to be a significant feature in the dynamics of business relationships. One or both of the parties may make adaptations to bring about initial fit between their needs and capabilities, but adaptation also may be necessary in an ongoing relationship as the exchanging parties are

exposed to changing business conditions. Moreover, within such ongoing relationships, the adaptations already made provide part of a framework for further business expansion.

These types of interfirm adaptations warrant study for several reasons. First, they may imply considerable investments by one or both of the firms. Second, they may be of critical importance for the supplier's possibilities of conducting business with the specific customer or for the customer's possibilities of securing needed products. Third, the investments made in interfirm adaptations often cannot be transferred to other business relationships. Consequently, the parties become tied together. Fourth, the adaptations may have important consequences for the long-term competitiveness of the firms—for example, when a supplier is forced by a customer to introduce quality management, which in turn enables the supplier to become competitive in other customer relationships.

The most widely treated case of interfirm adaptation is customization of products, that is, when the supplier produces according to specific demands by the customer. Such customization may involve dimensions, finish, materials, qualities, and several different aspects of a product. The product adaptations by the supplier may be small and have rather short-term consequences, or they may be large as when the supplier develops a new product to meet the requirements of a specific customer (von Hippel 1978). The supplier also may adapt production processes by purchasing new equipment, using logistic systems such as just-in-time (Frazier, Spekman, and O'Neal 1988), applying planning procedures (stock levels), and adopting various routines (quality controls) to meet the demands of a specific customer.

Correspondingly, the customer may adapt products, processes, and procedures to the capabilities of the specific supplier. Consider, for instance, the situation in which a supplier introduces a new version of a component so that the customer must modify one or several related components of the final product. Similarly, suppliers offering just-in-time deliveries may require the customers to adapt their planning and scheduling routines.

Social Exchange

The investments in adaptations correspond closely to the concepts of idiosyncratic investments and asset specificity in the transaction cost approach (Williamson 1979). Several researchers have used those concepts in explaining governance structures in marketing (Anderson and Weitz 1986; Dwyer and Oh 1988; Heide and John 1988; Jackson 1985). Other scholars have suggested agency theory as an appropriate tool for analyzing dyadic relations (Eisenhardt 1989). Both

transaction cost theory and agency theory aim basically at explaining the characteristics of a structure—governance or contract. The objective of our analysis is to explain the role of adaptation in business relationships. Though the transaction cost approach is highly relevant for the study of economic relationships, business relationships also include social aspects. Hence, to analyze the totality of the relationships, another approach is needed.

With our objective in mind, we turned to social exchange theory, which explicitly views exchange relations as dynamic processes. This theory has been suggested also as a framework for analyses of buyer-seller relationships (Dwyer, Schurr, and Oh 1987) and has been used fruitfully in studies of market relations (Anderson and Narus 1984, 1990).

Homans' (1958) propositions about interpersonal behavior suggest that interaction is a process in which two participants carry out activities directed toward one another and exchange valuable resources. They will continue to interact with each other only if they perceive that the exchange relationship is an attractive alternative. Otherwise they might find it more valuable to interact with others who can provide what they need, be it goods or affection. Hence, when two interacting persons face various contingencies, they may have to modify their resources to match each other's needs. In an exchange relationship between two parties, one or both of the parties can be expected to have to make adaptations to the needs of the counterpart. Exchange and adaptation, at least in a dynamic setting, will be closely related processes.

In social exchange theory as developed by Blau (1964) and Emerson (1962), two mechanisms can be used to explain such adaptations: trust and power. Building of trust is a crucial element in social exchange processes. In pure economic exchange, the exchange acts by the parties are simultaneous or at least enforceable; the theory of social exchange, in contrast, assumes processes evolving over time as the actors mutually and sequentially demonstrate their trustworthiness. They can demonstrate their trustworthiness by committing themselves to the exchange relationship, and one important way of showing commitment is by adapting to the other. Such adaptations by the parties can be of different kinds. One party may start by adapting the product and the other may respond by adapting production processes, which later leads to adaptation of logistic systems. Thus, interfirm adaptations in a business relationship are elements in a trust-forming social exchange process so that the adaptations—which may be of different kinds—by the two parties in the relationships are related positively to each other. This process can be considered as business investments made in order to strengthen

the social relationship between the parties in expectation of future business.

P₁: In working business relationships, adaptations made by one party are reciprocated by adaptations by the other party.

Power-Dependence

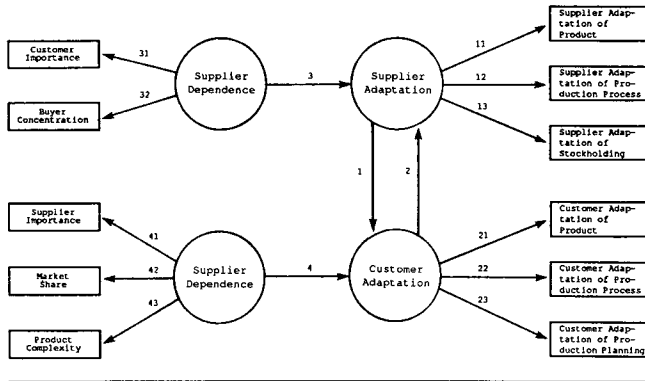
The role of power in social exchange was developed by Emerson (1962). In his formulation, the relative dependence between two actors in an exchange relationship determines their relative power. Power derives from having resources that the other needs and from controlling the alternative sources of the resources. This conception refers to the structural potential power of one actor in a relationship whereby that actor can influence the other to comply with the former actor's needs. Emerson's power model has been elaborated and generalized to the organizational level in the resource-dependence model as developed by Pfeffer and Salancik (1978). That model suggests that organizations respond to the demands of organizations that control critical resources. In this perspective, firms in a business relationship can be expected to adapt to each other to the degree that they are dependent on each other's resources.

The interparty dependence can be expected to have an effect on the parties' behavior in a business relationship. This effect is closely related to the findings in Porter's (1976) study of the effects on the profitability of retailers derived from the suppliers' bargaining power due to market position. The corresponding effects in our study are on the adaptation behavior by customers and suppliers. The stronger the market position of a firm, the more the other party can be expected to adapt to that firm.

P₂: In working business relationships, a firm adapts to a counterpart to the degree that it is dependent on that counterpart.

On the basis of our two propositions, a general structural model of adaptation in business relationships is formulated and analyzed empirically. The structural model, illustrated in Figure 1, accounts for mutual adaptation as a consequence of trust-building as well as for unilateral adaptation due to imbalanced dependence between the parties. The circles represent the four constructs of the model: customer adaptation, supplier adaptation, customer dependence, and supplier dependence. The boxes represent the measures chosen to indicate the constructs. The relations indicated by arrows 1 and 2 are reciprocal, that is, supplier adaptation influences customer adaptation, which reciprocally influences the former as implied by P₁. Arrows 3 and 4 are unidirectional, indicating the impact of dependence on adaptation (P₂).

FIGURE 1
A Structural Model of Interfirm Adaptation



Method

Measuring the Concepts

The endogenous variables of the model, supplier adaptation and customer adaptation, both are indicated by three items: adaptation of product, adaptation of production process, and adaptation of stockholding (in the case of the supplier) or adaptation of production planning (in the case of the customer). In Figure 1, these measurement aspects are represented by arrows 11 through 13 (supplier adaptation) and 21 through 23 (customer adaptation). The exogenous variables, supplier dependence and customer dependence, are measured by items referring to resource dependence and power position.

The resource-dependence model (Pfeffer and Salancik 1978) assumes that resource dependence refers to the availability of alternative sources for the resource and the possibilities of switching to other sources. The possibilities of switching to alternative suppliers or customers, and thereby the parties' dependence on each other, can be expected to be related to the shares the parties command of each other's business. This dependence is internal to the relationship, and it is represented by the items customer importance and supplier importance, measured as the customer's share of the supplier's total sales of the product and the supplier's share of the customer's total purchases of the product. These relations are represented by arrows 31 and 41 in the model.

Bargaining power, and hence the counterpart's dependence, is expected to be related to market position. The customer's bargaining power, and hence the supplier's dependence, is assumed to be related to the supplier's access to alternative customers. The fewer these customers are, the stronger is the bargaining position of the customer. This buyer concentration is measured by the share accounted for by the supplier's three largest customers. In Figure 1, this relation is

indicated by arrow 32. In the case of the supplier, bargaining power is represented by the supplier's market share in the customer's national market (arrow 42).

Product characteristics also are related to resource availability, as more complex products can be acquired only from a few suppliers, which increases dependence. This relation is indicated in Figure 1 by arrow 43.

The variables used are summarized in Table 1. The endogenous variables, customer adaptation and supplier adaptation, are based on detailed accounts by marketing managers about their companies and their customers' specific adaptations to each other (product, production process, production planning/stockholding). Hence, these variables do not represent attitudes to adaptations but recalled adaptation behavior. These descriptions were coded into three-level scales

TABLE 1
Variables and Operational Measures

Theoretical Constructs

Customer dependence
Supplier dependence
Customer adaptation
Supplier adaptation

Indicator Variables

Supplier Dependence

Customer importance: estimate of the supplier's sales of the selected product to the selected customer as a percentage share of the supplier's global sales of this product

Buyer concentration: estimate of the supplier's sales of the selected product to its three largest customers in the selected customer's country as a percentage share of its total sales of the product in this customer's country

Customer Dependence

Supplier importance: estimate of the customer's purchases of the selected product from the selected supplier as a percentage share of the customer's global purchases of this product

Market share: estimate of the supplier's market share for the selected product in the selected customer's country

Product complexity: 5-level scale based on detailed description of product and product use

Customer Adaptation (3-level scale based on detailed product description by the respondent)

Customer's adaptation of product
Customer's adaptation of production process
Customer's adaptation of production planning

Supplier Adaptation (3-level scale based on detailed product description by the respondent)

Supplier's adaptation of his product.
Supplier's adaptation of his production process.
Supplier's adaptation of his stockholding.

(none, small, large) by the interviewers (researchers), who followed a detailed coding manual.

The relative frequency of different adaptations made by the parties in the relationships are shown in Table 2 and details on the measurement of the adaptation variables are included in Appendix A. Product complexity was measured and recorded in the same way as the adaptations. The other variables are direct numerical estimates by the respondents.

The Empirical Base

The empirical analysis is based on a subset of the database established in the European International Marketing and Purchasing Project (Håkansson 1982). The data pertain to 237 business relationships of industrial suppliers in Germany (79), Sweden (102), and the United Kingdom (56) with customers in France, Germany, Italy, Sweden, and the United Kingdom. The firms are internationally oriented companies in the manufacturing sector.

A quota sample was used in the data collection so that the numbers of relationships were similar for materials, components, and equipment. The sample also was designed to include similar numbers of relationships with customers for unit production, mass production, and process production. Finally, it was designed to comprise the same number of relationships with customers in each of the five country markets, including the domestic market. The objective was to eliminate biases due to differences in product type, customer production technology, and customer country. Thus, of the 237 customer-supplier relationships, about a third derive from each of the three technology categories (with some overweight for mass production) and about a third represent each of the product categories (with some overweight for raw and processed materials).

The customer relationships to be studied were selected by marketing executives in the companies. The

relationships selected represented the most important customers in terms of invoiced sales in each of the customer countries. Interviews were conducted with marketing managers, who were required to have extensive personal business experience with the customer in question. Both in-depth and standardized data were collected.

Analysis Procedure

The analysis of the variables and the model was carried out by PRELIS and LISREL, two statistical packages for the study of structural equations models. PRELIS, a preprocessor to LISREL, is a software package that can provide a first descriptive look at the raw data before they are tested in a model. Furthermore, this program makes possible the computation of the appropriate data matrix for use as input to structural equation models. PRELIS was used for our sample and the distribution properties of the individual variables were jointly scrutinized. Polyserial correlations were computed for pairs of ordinal and continuous variables, polychoric correlations were computed for pairs of ordinal variables, and product moment correlations were computed for pairs of continuous variables.

The PRELIS data-screening and the computed joint distribution of the variables did not provide any reason to eliminate any of the variables. The computed correlation matrix (Appendix B) was used as input to the LISREL model and was tested by the maximum likelihood method. A weight matrix would have been preferable because it provides better fitting conditions and does not assume normal distribution of the variables (Jöreskog and Sörbom 1988). That method would have given lower chi square values, but it requires a large sample size and eliminates observations with missing values. Unfortunately, a weight matrix could not be computed in our study because of the relatively small sample.

Results

The application of the measurement and structural model of the customer-supplier relationship gave the results in Table 3 and Figure 2. As all the estimated t-values are correlated, it is not appropriate to study the probability value of each t-value separately. However, by a rule of thumb, t-values greater than 2 can be considered significant. The t-values indicate that all of the items satisfy this statistical criterion of significance.

The reliability of the items, measured as a percentage of the construct variation in the observed variable, indicates that (1) customer importance is the most reliable indicator of supplier dependence (.994), (2) product complexity is the most reliable indicator of

TABLE 2
Percentage Distribution of Adaptations in
Customer-Supplier Relationships
(n = 237)

Adaptation Type	None	Small	Large
Supplier adaptation of product	46	33	21
Supplier adaptation of production process	75	16	9
Supplier adaptation of stocks	56	27	17
Customer adaptation of product	72	16	12
Customer adaptation of production process	74	16	10
Customer adaptation of production planning	77	19	4

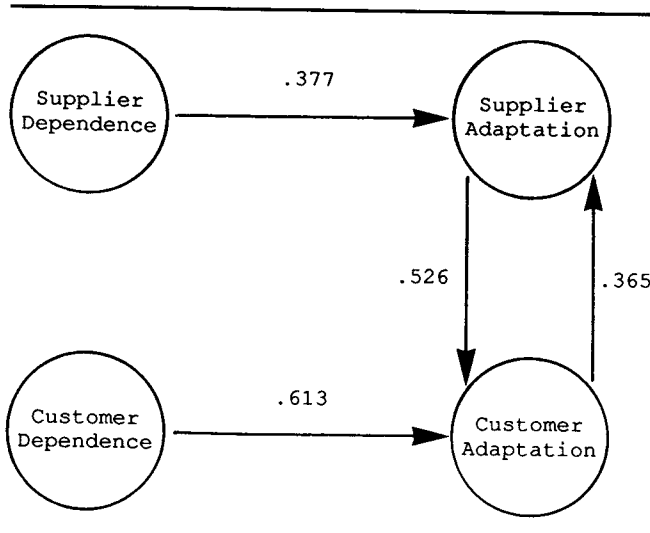
TABLE 3
Parameter Estimates and t-Values
(n = 237)

Arrow	Estimate	t-Value
11	.500	
12	.576	7.264
13	.367	5.819
21	.500	
22	.446	4.725
23	.341	3.893
31	.997	5.153
32	.397	4.074
41	.385	4.555
42	.371	4.391
43	.714	6.582
1	.526	4.251
2	.365	2.094
3	.377	2.653
4	.613	4.251

customer dependence (.510), (3) supplier adaptation of production process is the most reliable indicator of supplier adaptation (.572), and (4) customer adaptation of product is the most reliable indicator of customer adaptation (.292). The total coefficient of determination, a measure of how well the indicators jointly serve as measurement instruments for the constructs, jointly produced a reliability index of .729 for the adaptation variables and .997 for the dependence variables. These total coefficients of determination are high, indicating that the measurement model is acceptable.

The estimated structural relations (i.e., supplier dependence on supplier adaptation, customer dependence on customer adaptation, and the reciprocal effects between customer adaptation and supplier adaptation) are all significantly different from zero

FIGURE 2
Parameter Estimates



(t-values > 2). These findings are presented with parameter estimates in Figure 2 and Table 3. The predicted relationships are generally supported. The influence from supplier adaptation to customer adaptation (.526) is somewhat stronger than the reciprocal effect (.365). However, we cannot make any conclusive distinction about their relative strength as their confidence regions overlap. These values can be obtained readily given the parameter estimates and the t-values.

Finally, the quantities that measure the overall fit of the model produced $\chi^2 = 54.8$; d.f. = 38, $p = .038$. The goodness-of-fit index measure is .960 and the root mean square residual .048. Unlike chi square, the goodness-of-fit index is relatively independent of the sample size and relatively robust to departures from normality (Jöreskog and Sörbom 1988). The magnitudes of these measures indicate that the overall structural model is acceptable.

Discussion

The results of the LISREL analysis of the structural relation model support the view that interfirm adaptations are elements in a social exchange process. Partly the adaptations are made unilaterally as a consequence of imbalance in the interfirm power relation, and partly the adaptations are reciprocal demonstrations of commitment and trust in the relationship. This view is supported by both the structural relation model and the measurement model. The latter shows that the diverse adaptations can be seen as indicators of the common theoretical constructs—supplier adaptation and customer adaptation.

The model is symmetrical in the sense that the same theoretical constructs are used to explain the adaptation behavior of both parties in the relationships. The result also indicates symmetry as the test does not reveal any significant differences between the parties in the explanation of adaptations. Furthermore, the effect from supplier adaptation to customer adaptation is not different from the effect in the opposite direction.

For the power relations, we find that two sets of factors have a significant effect on the adaptation behavior of the firms. One, market dependence, pertains to the market structure surrounding the relationship (i.e., degree of buyer concentration and market share of the supplier firm). The other is internal to the relationship, entailing the share the firms command of each other's business and the complexity of the product exchanged. The test shows that internal dependence has a stronger effect than market dependence on the adaptation behavior of both parties.

Research Implications

The fact that our analysis is based on cross-sectional data on European business relationships raises a ques-

tion of the extent to which the results are conditioned by the specific European cultural and institutional setting. It is sometimes argued that European and especially Japanese firms have a more long-term approach to their business relationships and are more inclined to cooperate than their U.S. counterparts. According to that argument, reciprocal adaptation should be less common in U.S. business markets. Comparative studies of interfirm adaptation could investigate whether the social exchange mechanism operates in the same way in different countries. Differences can be found on several levels. First, is the structural relation model supported when applied to U.S. and Japanese data? Second, are there significant differences between countries in the strength of the structural relations? Third, are there differences between the countries in the reliability of the indicators? Tentative analyses of subsets of data from different European countries, though based on too small samples, indicate that comparisons may be worthwhile (Hallén, Johanson, and Seyed-Mohamed 1989).

The adaptation variables used in our study are closely related to technology. In organization theory, technology is assumed to have a strong effect on organization structure (Thompson 1967). Correspondingly, technology can be expected to be an important factor conditioning business relationships. Hence, continuous production technologies (i.e., process production) can be assumed to have a lower adaptation ability than unit and small-batch production. Consequently, different technologies can be expected to lead to different patterns of interfirm adaptation. Cross-technology comparisons can be done on the same three levels as cross-country comparisons.

Social exchange processes are time-dependent. Exchange relationships have a history, and the outcomes of previous business episodes provide a framework for subsequent interaction. Adaptation behavior therefore can be expected to vary between the relationship stages: in the initial stages, adaptations are made to create interfirm fit and to build up the relationship, whereas in mature stages, where commitment is present in the interfirm relationship, adaptations basically are made to support and expand current business (cf. Dwyer, Schurr, and Oh 1987; Ford 1980). This interstage variation in adaptation behavior is associated with differences in the time perspective, which is expected to be more future-oriented in initial relationship stages, the degree of reciprocity, which is expected to be lower in the beginning, and the impact of external conditions, which also is expected to become weaker as the relationship matures.

It is resource-demanding to conduct longitudinal studies of a sufficiently large number of business relationships. Instead, adaptation dynamics could be explored with cross-sectional data from business relationships in different development stages.

Managerial Implications

Interfirm adaptation as discussed here may be either unilateral, based on the power-dependence situation, or reciprocal, created through the exchange processes between the firms. The unilateral adaptations indeed imply costs for the firm making the adaptations. However, as the adaptations are investments, they can be expected to pay off in the short or in the long term. Adaptation to demanding customers can strengthen the firm's competitive position in relation to other companies, as the adaptations may result in superior products or production systems. Over time, the unilateral adaptations are instrumental in forging strong customer-supplier relationships based on reciprocal adaptation.

Reciprocal adaptation also implies cost. The mutual investments in positions with the other firm may be difficult to transfer to other uses. However, as these investments tie the firms together in strong customer-supplier relationships, they form the basis both for business expansion and for securing current sales or supply sources.

The process character of interfirm adaptation makes it difficult to pinpoint when decisive investment decisions of a unilateral or reciprocal kind have been made. The adaptation process consists of many small steps, but its outcome in terms of competitive positions and strong customer-supplier relationships may be of determining importance to the firms.

Appendix A

Measurement of Adaptation Variables

Question Formulation

I would now like you to go through a list of either adaptations that you may have made in order to suit your customer's requirements, or adaptations that he may have made to meet your wishes. Please tell me for each adaptation whether it has been made or not.

- (1) If the adaptation has been made, I would like to know more details about what was actually done; why the adaptation was made; who initiated the process leading to the adaptation; who was involved in it.
- (2) If no adaptation has been made but such an adaptation has been discussed seriously by the parties, I would like to know more details about the proposed adaptation; why the adaptation was not made; who initiated the discussions; who was involved in them.

Adaptations Made by the Customer

Has this customer modified his final product in order to suit your product?

Has this customer adapted certain production procedures as a consequence of using your product?

Has this customer modified his production schedules in order to meet your delivery capacity? (. . .)

Adaptations Made by Your Company

Have you modified your standard product in order to suit the requirements of this customer? (. . .)

Have you modified your production process in order to suit the requirements of this customer?

Have you changed your stock location policy in order to meet requirements of this customer? (. . .)

Measurement Scale for Coding

Open-Ended Answers

1 = none

2 = small

3 = large

Appendix B Correlation Matrix

	CAP	CAPP	CAPL	SAP	SAPP	SAS	BC	CI	PC	SI	MS
CAP	1.000										
CAPP	.169	1.000									
CAPL	.061	.216	1.000								
SAP	.304	.206	.107	1.000							
SAPP	.220	.227	.299	.524	1.000						
SAS	.201	.227	.290	.267	.351	1.000					
BC	.107	.112	.043	.057	.122	.039	1.000				
CI	.260	.177	.103	.240	.301	.217	.396	1.000			
PC	.320	.287	.126	.152	.147	.064	.124	.103	1.000		
SI	.096	.135	.125	.052	.049	.002	.032	.165	.285	1.000	
MS	.154	.115	.089	.143	.142	.075	.077	.238	.260	.566	1.000

CAP = customer's adaptation of product

CAPP = customer's adaptation of production process

CAPL = customer's adaptation of production planning

SAP = supplier's adaptation of product

SAPP = supplier's adaptation of production process

SAS = supplier adaptation of stockholding

BC = buyer concentration

CI = customer's relative value of sales (i.e., the share of the selling firm's turnover represented by the customer's purchases)

PC = product complexity

SI = supplier's relative importance by purchase value (i.e., the share of the buying firm's purchases for the product in question represented by the supplier's sales)

MS = supplier's market share

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