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Purchasing Consortia: Theoretical Framework and Empirical Data

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1. Basics

1.1 Purchasing as Strategic Value Chain Activity

Modern management concepts like lean production or business reengineering are basically referring to companies which have clearly defined their core competencies. By studying the real competitive advantages of a company, this focus leads towards a redefinition of main activities. In general, a big number of companies are still too much production oriented with a high ratio of internal value creating. Instead of using the know-how and scale effects and specialization of suppliers, a big variety of goods and services are produced internally.

Increasing worldwide competition requires more flexibility on sales markets. A concentration on core competencies guarantees higher flexibility by outsourcing non-relevant activities to third party suppliers. Manufacturing penetration is decreasing and the importance of strategic supply market management comes up. By outsourcing main tasks and responsibilities, suppliers are becoming more and more an important source of competitive advantage. Modern manufacturing concepts like modular sourcing or factory within a factory start to 'de-materialize' the end product manufacturer. As a consequence, the company's main job is to manage and coordinate an efficient supplier base. Strategic supply management is the value chain activity responsible for costs of up to 80% of total revenue (*Arnold* 1995).

1.2 Cooperation in the Field of Supply Management

The new 'de-materialized' company can survive only by being open for cooperative activities. Instead of building up know-how and capacities by itself, the enterprise is a member of flexible networks. They are formed by inter-organizational cooperation.

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Although cooperation has been defined in different ways, there are some constitutional features which are often discussed in cooperation theory (*Rotering* 1993):

- Independence of cooperation members is a criteria used by law to distinguish a cooperation from a merger. That causes tensions between autonomy (cooperation member as individual company) and dependence (in the special field of cooperation).
- An inter-organizational cooperation necessarily consists of two or more companies as members.
- The main interest of the cooperation is an ex ante matching of plans or coordination of single interests, normally in real business functions like purchasing.
- The main goal of a cooperation is to reach better economic results for all cooperation partners.

Cooperation is one way to develop external synergy effects instead of doing it individually as a 'do-it-yourself'-strategy. The cooperation members expect to realize these effects without loosing their independence as it would be in case of merging activities.

Supply management is (like marketing) a so-called 'border crossing function' of the company. It manages all activities linked to the supply market. Therefore, purchasing has to be open-minded and outward-oriented. This is the main prerequisition for establishing a successful cooperation. In the field of supply management we can distinguish three types of cooperation (*Arnold/Essig* 1997):

- Cooperation type 1 is the so-called *internal supply cooperation*. It results from the position of purchasing as an external oriented function of the company. The supply management is able to give valuable input to e.g. r&d or manufacturing which forces close cooperation with these functions or value chain activities.
- Buyer-seller-cooperations are vertical supply cooperations (cooperation type 2). From a buyer's position it means strategic supplier partnering which is closely related with modern sourcing concepts like single sourcing (*Hendrick/Ellram* 1993). From the seller's point of view it is characterized as a marketing cooperation with important customers (A-customers; key accounting).
- Our main interest is the horizontal supply cooperation (cooperation type 3; *Arnold* 1995). We call that *consortium purchasing*. In fact, cooperation between industrial companies in purchasing is not widespread. In Germany, the idea to concentrate demand volume

in order to get a stronger position in respect to the supplier side has often been established in trade but not in industry (*Neumann* 1992).

In fig. 1 we are using *Porter's* value chain concept (1985) in a modified way to illustrate the three cooperation types in general.

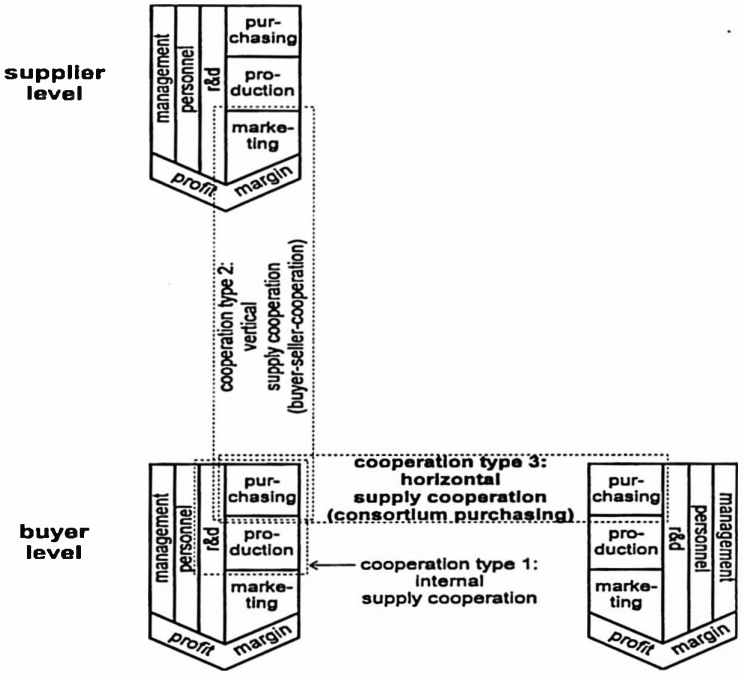

Fig. 1: Three types of cooperation in supply management

1.3 Research Methodology

As mentioned above, it is not possible to analyze a bigger number of industrial purchasing consortia because they are not widespread in reality. To generate valuable empirical data, we had to fund, finance, and carry out a suitable action research project. We were successful to organize the project "Consortium Purchasing of Small and Medium Sized Companies in Baden-Wuerttemberg". Participants were thirteen small and medium sized companies located in the south area of Germany. The project was supported by the local Ministry of Economy (*Arnold* 1994, *Arnold* 1996, *Wirtschaftsministerium*

of the County of Baden-Wuerttemberg 1995). The basic idea of this project was to create a powerful inter-organizational supply organization in order to realize combined competitive advantage by a number of organizational buyers. The research approach is to confirm a theoretical framework by empirical findings. In an action research project, the researcher participates actively in the design of the research object. Therefore, the analysis of decision making processes and results is very detailed.

1.4 The 'History' of Consortium Purchasing: Cooperative Movement

As mentioned above, purchasing consortia are not widespread in the industrial sector today. In the U.S., especially hospitals and universities established a lot of purchasing cooperatives. One of the largest purchasing cooperatives is the Educational & Institutional Cooperative Service (E&I, strongly connected with the National Association of Educational Buyers/ NAEB) with more than 2.000 members of the public sector.

In Germany, the idea of cooperative purchasing was founded in the early 19th century. Hermann Schultze-Delitzsch (1808-1883) and Friedrich Wilhelm Raiffeisen (1818-1888) established the modern cooperative movement. The main ideas were cooperative purchasing and cooperative selling of goods and material items as well as credit cooperatives. Later on consumers' cooperatives came up (*Aschhoff/ /Henningsen* 1995). Today, cooperative movement plays an important role in the German economy. In 1986, more than 35% of food sales were purchased by cooperatives.

Some data about cooperative movement in Germany today are shown in fig. 2:

2. Theoretical Framework

The main aim of the theoretical framework regarding consortium purchasing is to analyze why this type of cooperation exists. Therefore, a two-step approach will be developed. In the first step, the explanatory approach uses the new institutional economics and transaction cost economics to identify cooperation and consortium as third, hybrid institution between market and hierarchy. However, the new institutional economics is not able to explain the

central instrument used by purchasing consortia. This instrument is the effect of bundling purchasing power. In the second step of the explanatory approach the purchasing experience curve is developed as the 'linking pin' to close this gap.

type	number	members	turnover (Mio. DM 1993)
food trade cooperatives	35	14.381	41.373
non food trade cooperatives	88	34.613	22.523
food craft cooperatives (e.g. baker, butcher)	214	52.215	5.344
non food craft cooperatives (e.g. plumber, joiner)	342	70.185	5.104
other cooperatives (e.g. tax consultants)	710	201.639	8.712
total	**1.389**	**373.033**	**83.056**

Fig. 2: Cooperative movement in Germany (adapted from Aschhoff/Henningsen 1995)

2.1 The New Institutional Economics: Consortia as Hybrid Institutions

For the first step of the theoretical framework, we will use the concepts and ideas developed by *Coase* (1937) and *Williamson* (1985) who are the main representatives of transaction cost economics.
There are a few basic behavioral assumptions of the new institutional economics which are important for a clear understanding of the heuristic model formulated by *Williamson* (1985):

- Bounded rationality must be understood as a construct of decision making behavior which is located in between of so-called absolute rationality and process rationality. Because of incomplete information and restricted human information processing, rationality can never be completely (*Simon* 1976).
- Opportunism is the main characteristic to pursue individual interests (*Williamson* 1985).
- Methodological individualism means that multi-personal organizations like companies do not have a personality of their own; they are just a conglomerate of individuals.

- Property rights are the main interest of the economic analysis in the new institutional economics. They are handled in a purely physical or a relative-legal way. Because of that, *Williamson* (1989) talks about the firm (and the cooperation) as a "nexus of treaties".

Coase (1937) was the first to spread the idea that usage of markets to realize transactions normally causes costs. Cooperation exists because there are transaction costs using the market (or price mechanism). The costs for finding an exchange partner or to agree and to control the transaction are defined as transaction costs. They are depending on:

- uncertainty as a result of opportunism,
- strategic importance of the transaction,
- frequency of the transaction,
- asset specificity, which means particularly (1) site specificity, (2) physical asset specificity, (3) human capital specificity, (4) dedicated assets, (5) brand name capital.

Fig. 3 shows the heuristic model developed by *Williamson* (1985): It explains that some economic transactions could be handled in markets or in other cases by hierarchical coordination. Hierarchy refers to the existence of companies. Depending on the specificity s, there are organizational costs of hierarchy H(s) and market (or transaction) costs M(s). The marginal transaction costs are always higher than marginal hierarchy costs because of the low action flexibility of markets. Transaction cost advantages $\Delta G=H(s)-M(s)$ are the difference between hierarchy costs and transaction costs. Increasing specificity creates at least disadvantages. But of course there is another important aspect which must be considered: The production costs C and the economies of scale. ΔC is the production cost difference between 'make' and 'buy'.

Obviously the total cost advantage of market coordination $\Delta C+\Delta G$ is the efficency criteria which is relevant to decide between market transaction and hierarchy. When these total cost advantages turn into disadvantages (at s_2) market will be substituted by internal (production) activities of a company. This is the explanation why companies do exist.

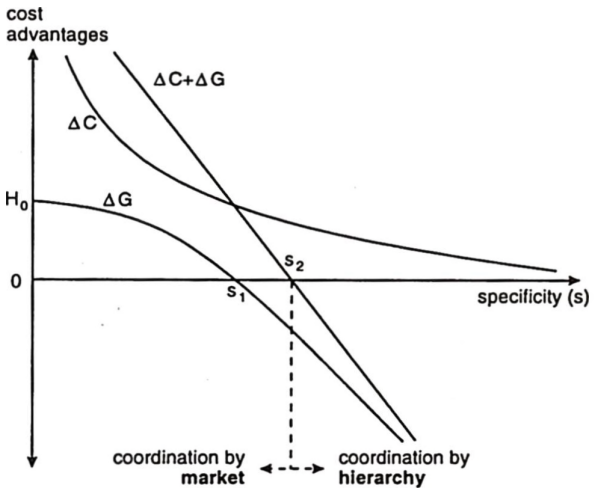

Fig. 3: Market versus hierarchy-dichotomy

This dichotomy (market versus hierarchy) has been criticized. One of the critical points is the "in between" situation in case of a middle degree of specificity which causes interpretation problems. Neither market nor hierarchy could be preferred only on marginal cost difference. Williamson himself argues that the decision for one institution is often based on "historical coincidence" (*Williamson* 1985).

As a consequence a third, *hybrid institution* with both market and hierarchical elements was introduced (Williamson 1990, *Williamson* 1991) and defined as *cooperation* or *consortium.*

The specificity-depending cooperation costs X(s) have a pattern of cost behavior between market and hierarchy (shown in fig. 4):

There is a wide range of different hybrid institutions between market and hierarchy. That is why consortia can be organized in quite different ways. Depending on the degree of market and hierarchical coordination, there is a wide spectrum between exchange of information (mostly market coordination) and establishing an individual company owned by all cooperation members (mostly hierarchical coordination). This so-called band of transaction patterns is shown in fig. 5:

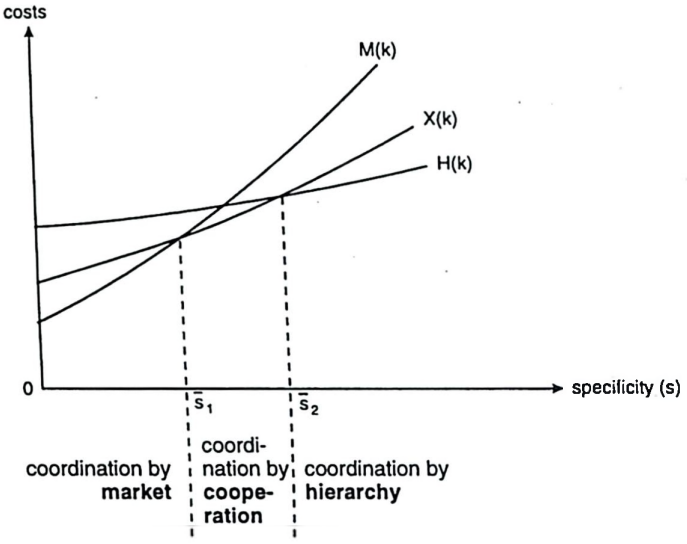

Fig. 4: Cooperation as hybrid institution

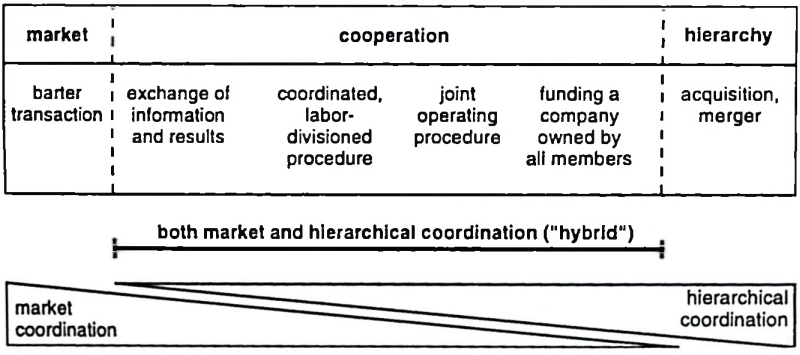

Fig. 5: Band of transaction patterns

But there are also some problems with the transaction cost economics. In general, it is difficult to operationalize transaction costs in a clear and complete way. The validity of central hypotheses of transaction cost economics concerning cooperation only refers to vertical cooperations, especially make-or-buy decisions and vertical integration. The reduction of the number of transactions is the only

way to explain the advantages of purchasing consortia by transaction cost economics directly. For example, four buyers establish a consortium dealing with three suppliers. The number of transactions can be reduced from (4 x 3 =) twelve to seven (4 within the consortium + 3 with the suppliers). Transaction costs in general will be reduced.

Nevertheless, this explanation is scanty. Of course, the introduction of the hybrid institution is an important progress in cooperation research in general and shows that there is the consortium "in between" the existance of companies and the existance of markets. It uses the advantages of both institutions' coordination systems. But for explaining the central mechanism of purchasing consortia there is a deficit.

2.2 Using the Experience Curve to Explain the Benefits of Purchasing Consortia

To close the remaining gap, an extension has to be developed. Therefore, the experience curve should be explicitely regarded because it contributes to explain the central effects of consortium purchasing. The experience curve (fig. 6) was first discussed and analyzed by the Boston Consulting Group ("Boston effect"). The central idea is the empirically based evidence that doubling the output volume will create the possibility of decreasing cost per unit output by 20-30%. The reasons for this cost reduction per unit are different:

- There are higher volume effects (economies of scale).
- There might be an expansion of plant facilities and capacities including better technology reducing the fraction defective.
- Increasing production volume is normally connected with lower investment expenditure for the last installed unit of capacity.
- Finally some soft factors referring to improve and use in a more efficient way human capital (intensity and quality of suggestions for improvement; quality circle activities etc.) create lower cost structure in the business activities.

If purchasing is defined as an input-output-system, the same pattern of cost behavior can be assumed. These costs are the 'production costs' of 'producing' procurement output for the company's other value chain activities regarded as a kind of customer.

They are additional costs to the transaction costs as shown in the explanation above (e.g. fig. 3). As a result of analyzing the experience curve we can expect that doubling of the output by concentrating demand as a result of consortium purchasing can provide 20-30% reduction of the material item costs (*Arnold/Essig* 1997). This is the main reason why hybrid institutions are advantageous in a horizontal orientation, too.

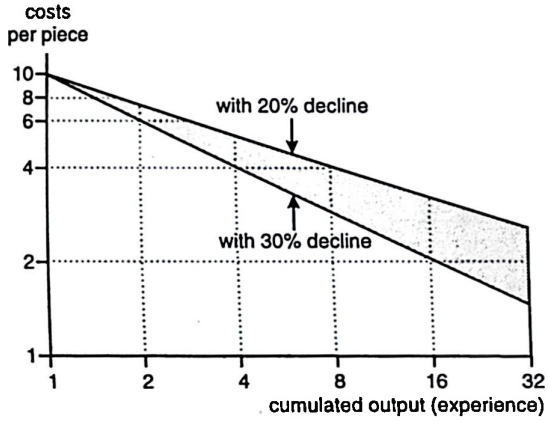

Fig. 6: Experience curve

3. Design of Purchasing Consortia: Cooperation Management

Realizing purchasing consortia has to be based on a systematic design approach. Whereas the explanatory approach answered the question why purchasing consortia do exist and why they are advantageous, the design approach answers the question how to establish and run such a consortium effectively.

So we use the idea of cooperation management developed from the general management process to show the design alternatives of purchasing consortia. The cooperation management process can be divided into the phases of planning, realizing and controlling of consortium activities. The focus of planning is the choice of cooperation partners (team formation) and goal setting. In respect to the selection of partners it is helpful to look on a 'procurement fit' which leads to two different types of horizontal purchasing consortia

called A- and C-consortium. On the other hand we distinguish between multiple item and single item consortia.

In the realizing phase an appropriate organizational structure must be developed and process activities have to be defined. A three-level organizational structure has been used and evaluated in an empirical pilot project. The cooperative sourcing process includes six steps from agreement on specifications to negotiations and completion of contract. Finally in the controlling phase a detailed performance measurement concept must be developed to show the advantages for the cooperating companies.

3.1 Planning Phase: Choice of Partners and Setting Goals

Before starting consortium activities, adequate cooperation partners have to be found. Every potential member has to be examined in detail because the partner decision can not be revised easily. Traditionally, the compatibility of cooperation members is described as fit (*Bronder/Pritzl* 1992). A high fundamental, strategic and cultural fit is necessary (fig. 7).

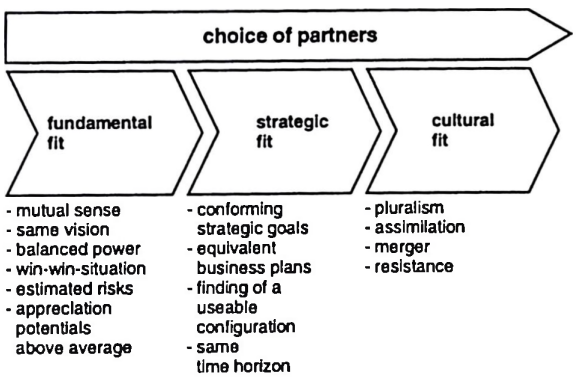

Fig. 7: Fundamental, strategic and cultural fit

Talking about horizontal cooperation in the field of supply management we have to recognize the special characteristics of this cooperation. According to the multi-causal explanatory approach a multi-causal fit construction has to be developed.

The compatibility of purchasing object characteristics triggered by internal and external requirements leads towards the procurement fit and creates two types of purchasing consortia defined as A- and C-consortium. Basic idea is the ABC-analysis for a classification of purchasing items (*Grochla/Schoenbohm* 1980; fig. 8).

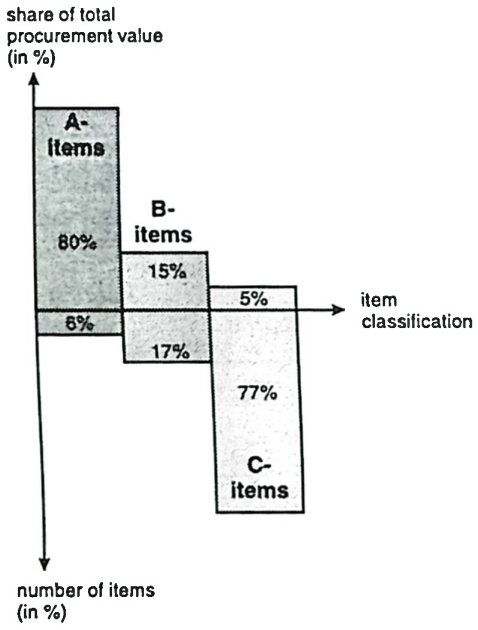

Fig. 8: ABC-analysis

A-consortia are directed to concentrate on A-components. In this case, economies of scale are the main effect within the experience curve approach. Sometimes problems with antitrust laws may occur.

C-consortia are referring to C-components which are typically used in almost all industrial production processes and in administration. To realize experience curve effects, economies of information, economies of scope and economies of process are used. C-consortia make use of the different strengths and market know-how of every single cooperation partner. Instead of having A-part-homogenous partners the right 'mix' has to be focused.

Before starting detailed purchasing work within the consortium, all members have to agree about the consortium's goal or goals. Therefore, two main directions can be identified: To focus on a single item for consortium activities or to give up individual sourcing activities and establish a multiple item consortium which is responsible for more than one goal. Single item cooperations are working together in either (1) a defined procurement region (e.g. cooperation for global sourcing) or (2) in a single field of the procurement process (e.g. procurement market research) or (3) in one category of procurement items (e.g. steel products).

Our action research project entitled "Cooperative Purchasing of Small and Medium Sized Companies in Baden-Wuerttemberg" is an example for a multiple item cooperation (*Arnold* 1994). Fig. 9 shows the aims of this project:

economic goals	technological goals
– increasing process efficiency because of specialization of procurement tasks	– stimulate simultaneous engineering/early supplier involvement
– setting-up competence centers and reaching higher transparency of procurement markets	– concentration on core competencies
– optimization of procurement items by standardization of goods and reaching direct supplier advantages in prices and conditions	– modular sourcing
– creating more powerful market position	– substitution of material and technology
– increasing international or global sourcing	– using modern information and communication technology
– more sourcing of required service functions	

Fig. 9: Example for a multiple item cooperation

3.2 Realizing Phase: Organizational Structure and the Sourcing Process

After setting the fundament for the consortium, the next step in the cooperation management process is to carry out the operations. Therefore it is necessary to develop a suitable origanizational structure and the cooperative sourcing process. The structure is the 'frame' that enables process performing (see fig. 10):

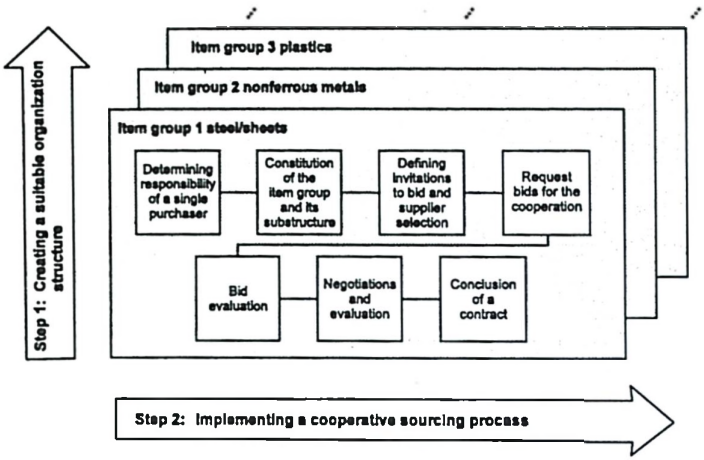

Fig. 10: Structure and processes

For step 1, the organizational structure must be divided into three levels indicating different working levels.

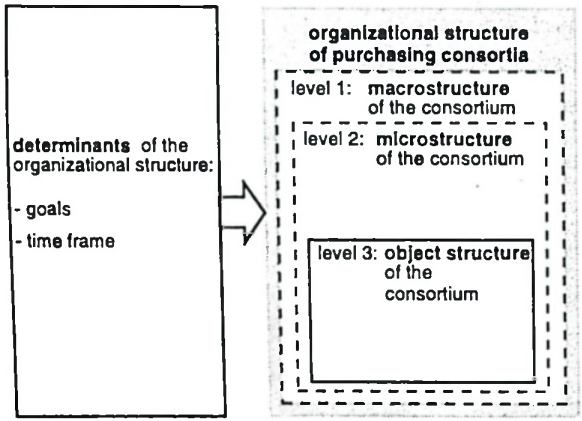

Fig. 11: Three-level organizational model for consortium purchasing

The macrostructure decision on level 1 refers to a consortium as a less or more informal project organisation or to a new company with own legal entity. It determines the position of the consortium on the band of transaction patterns. Having a single item project organization just for infomation exchange means a position close to

market coordination, whereas the multiple item consortium company is predominantly hierarchically coordinated. The decision between an informal project or a formal consortium company is determined by the time structure. For a short time or in an experimental phase there is no need to establish a new company.

The microstructure (level 2) covers the internal relations of the cooperation. For our action research project, we established a project structure with three elements: Management committee, project management, and core team. The management committe consisting of the general managers of the cooperation member companies and representatives of the funding ministry has been in charge on top of the hierarchy. This committee met three to four times a year. The project management was responsible for steering the complete project activities, while the core-team with procurement managers of all member companies dealed with the day by day activities in the cooperative sourcing process.

Level 3 describes the object structure within the cooperation. In the action research project we defined a catalogue of 29 so-called item groups. Each item group covered specialized materials and was given an individual priority (fig. 13). It is a very flexible instrument because item groups can be started or finished immediately. The individual cooperation partner (procurement manager) was not obliged to be a member of every item group. Instead, he could decide on his membership depending on his demand and interests.

There has not been enough capacity to deal with all 29 item groups during the defined project time structure. Within the project time schedule from January 1994 to September 1995 in fact 15 item groups have been analyzed and handled. 86% of the total procurement budget of the cooperation members are represented by these item groups (fig. 12).

Within this three-level 'nested approach' organization the cooperative sourcing process proceeds. Fig. 14 shows a comparison of the sourcing process in general with the cooperative sourcing process. This process includes six steps:

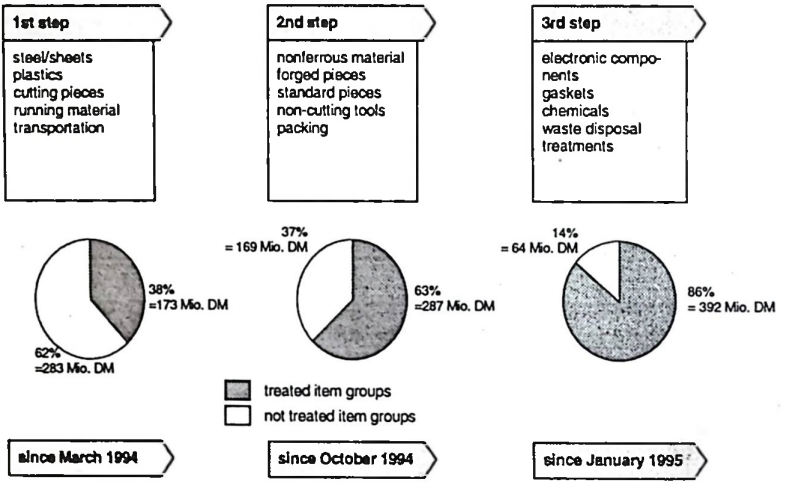

Fig. 12: Three-step procedure for dealing with the item groups

The first step means to define a coordinator for every item group. The coordinator is a member of the core team. Because he has the general responsibility for a single item group, he typically represents the largest purchasing power of all members of the group. He has to initiate the constitutional meeting of his item group (step 2). Now every member defines the specific demand of his own company. Then the group selects all suppliers which should be contacted to offer bids (step 3/4). It is the coordinator's job to distribute one common request for bids comprising the demand of all cooperation members. The results have to be evaluated and the suppliers with the best bids are invited to further negotiations (step 5). In case of acceptable results for all cooperation members the group concludes a contract with the best supplier(s) for their item group (step 6).

3.3 Controlling Phase: The Problem of Performance Measurement in Purchasing Consortia

In general, the performance of purchasing consortia includes two parts: There are direct results achieved by using the formal structure of a consortium and there are bonus effects obtained by informal bilateral or multilateral contacts between cooperation members.

item group	procurement budget (TDM)	percentage (%)	accumulated percentage	priority
steel/sheets	72.527	15,90	15,90	A
plastics	54.429	11,94	27,84	A
electronic components	46.576	10,22	38,06	A
nonferrous metal	45.372	9,95	48,01	A
non-cutting tools	41.310	9,06	57,07	A
treatments	29.511	6,47	63,54	A
cutting pieces	19.453	4,27	67,81	A
transportation	17.913	3,93	71,74	A
castings	17.568	3,85	75,59	A
pressed, drawn, bended pieces	16.787	3,68	79,27	A
flexible tubes	15.046	3,30	82,57	B
liquefied and pressed pieces	12.246	2,69	85,26	B
forged pieces	10.468	2,30	87,56	B
running material	9.034	1,98	89,54	B
packing	8.902	1,95	91,49	B
standard parts	8.700	1,91	93,40	B
business services	5.814	1,28	94,68	B
chemicals	4.344	0,95	95,63	C
information processing	3.598	0,79	96,42	C
waste disposal	3.438	0,75	97,17	C
typography	2.829	0,62	97,97	C
gaskets	2.657	0,58	98,37	C
moulded rubber parts	2.342	0,51	98,88	C
protection of labour	1.360	0,30	99,18	C
office supplies	1.265	0,28	99,46	C
pumps/electric thrustors	896	0,20	99,66	C
maintenance material (electro)	780	0,17	99,83	C
welding material	616	0,13	99,96	C
sintered parts	192	0,04	100,00	C
total	**455.973**			

Fig. 13: Item groups and their priority

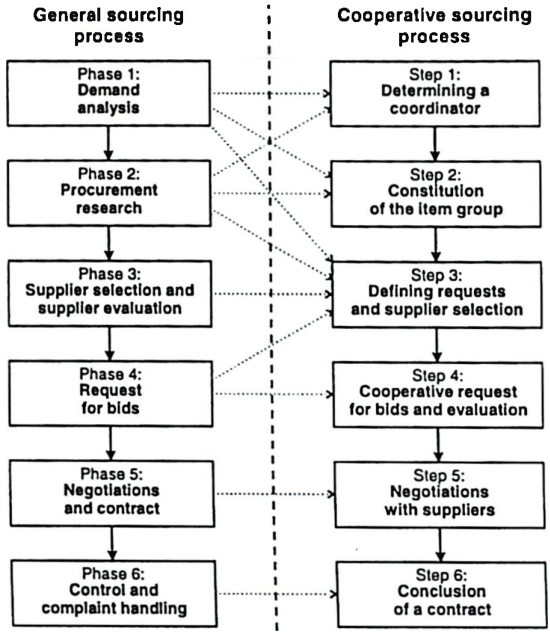

Fig. 14: Comparison of general and cooperative sourcing process

But there are only few results which are measurable in money terms. Know-how transfer, process improvements, higher information level have to be controlled by a multi-level based performance measurement concept which we developed for this action research project. It includes four levels as shown in fig. 15:

On the first level (level A) the financial results of the single items have to be scrutinized. Because of the typically larger number of articles the consortium can make use of so-called 'leading goods'. This is a small number of reference articles which are 'typical' for an item group. In the action research project, we had to deal with more than 1.100 different articles; because of this we reduced the high number to three leading goods for every item group.

The financial results for the whole item group could be measured on the next level (level B). To eliminate exogenous influences not controlled by the consortium and its members, a general market price has to be found. Such market prices are usually provided by external sources like trading companies, wholesalers,

information brokers or professional associations like the BME (German equivalent to the American NAPM) specifically for each item group.

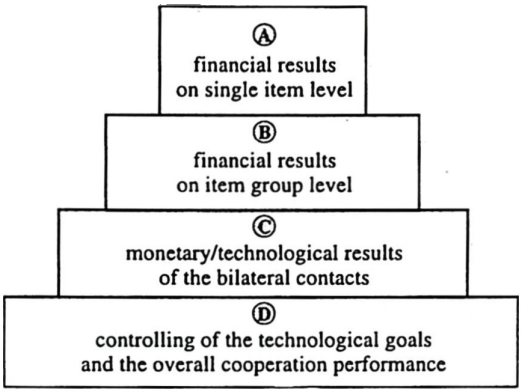

Fig. 15: Performance measurement concept

Level C measures direct bilateral contacts between the cooperation members, level D the overall consortium performance.

4. Findings from the Action Research Project

The empirical verification of central hypotheses of the theoretical explanatory approach for purchasing consortia is possible by using parts of the performance measurement concept for the action research project (*Arnold* 1996).

4.1 Results Confirming the Experience Curve Effect

Referring to level B of the performance measurement concept we defined an average price level of 100% for each item group at the beginning of the project in 1993. At the end of the cooperative sourcing process of an item group every cooperation member reported his new price level. Fig. 16 presents a comparison between the average price level of the cooperation members and the market price level. It shows that the aggregation of demand created a cost reduction which coincides with the general message of the experience curve. In fact, the cost reduction was between 1% (minimum) and 15% (maximum).

Item group	price level cooperation members (average)	market price level	difference
steel/sheets	108 %	115 %	- 7 %
nonferrous material	112 %	127 %	- 15 %
plastics	119 %	125 %	- 6 %
cutting pieces	104 %	108 %	- 4 %
non-cutting tools	103 %	110 %	- 7 %
running material	89 %	99 %	- 10 %
packing	118 %	119 %	- 1 %
transportation	89 %	90 %	- 1 %

Fig. 16: Price level of the cooperation

Based on these figures the individual advantage of each cooperation member can be analyzed. The individual results show a very wide range, running from DM 572.000 (maximum) to DM 18.000 (minimum). The total cost advantage for all participants comes to about 1,5 Million DM.

Examining a general percentage according to a 'consortium experience curve' is not possible with analyzing one consortium only. Therefore, future research projects have to collect data of a wider range of consortia to generate a general pattern of cost behaviour.

4.2 The Purchasing Consortium as a Network

According to chapter 2.1, a consortium is a hybrid institution which adds a hierarchical element to the former just market-oriented contacts between the cooperation members. The level C results in the action research project enabled us to visualize the cooperation partners' contacts as an information and communication network (fig. 17). U1 to U13 stand for the cooperation members (companies), the arrows describe the contacts between them. These contacts include information exchange or more like delivery contacts and technological joint ventures. In other words, the arrows are the 'hierarchical element' which has taken place in the cooperation members' contacts. Without the arrows, there would just be market coordination; the arrows are indicating that a network with hybrid coordination pattern was created.

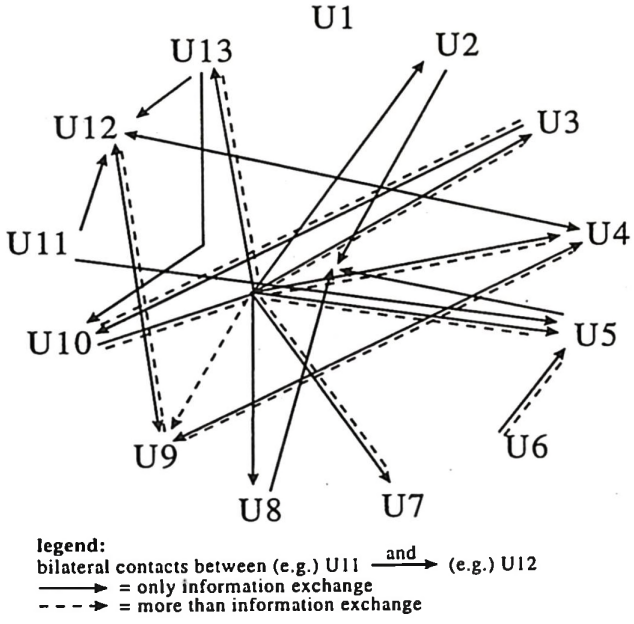

Fig. 17: Network of bilateral contacts

The results validate the theoretical framework with empirical data. Purchasing consortia are a strategic weapon for generating power on supply markets especially in case of small and medium sized companies. Being part of an integrated supply management, they contribute in generating competitive advantage.

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