ORGANIZATIONAL STRUCTURE OF PLANNING SYSTEMS IN DIFFERENT ENVIRONMENTS

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1. Organizational structuring as the result of practical constraints and scope of action

The structuring of man-made systems (cultural systems) is carried out within constraints. These restrictions, which are frequently termed "practical constraints", are due firstly to the *laws of nature.* Man cannot disregard the laws of gravity when designing and constructing a lift. A second type of restriction is that inherent in the *structure of system*, i.e. the elements to be joined together must be compatible. A participative style is not compatible, for example, with an information gradient between the group members. Consequently, if a system is to be structured so that the group members have decision-making powers, corresponding informatory regulations must be made. Thirdly, system structuring is characterized by *behavioural restrictions,* i.e. certain behaviour patterns are impossible as a result of codified regulations or recognized standards. For example, floggings or imprisonment are impossible in present-day companies reward-and-punishment systems, whereas this was quite acceptable behaviour at the time of the Roman Latifundia. In spite of the restrictions due to the laws of nature, system structure and behaviour patterns, the designer of cultural systems still has a more or less large scope of action that corresponds to a multiplicity of technical and social solutions, as for example in the case of different types of motorcars (Szyperski and Müller-Böling, 1981, p. 160).

Furthermore, man is in a position to remove or change at least the system structure and behavioural restrictions in actual situations or in general (Galtung, 1977). Consequently, an individual culture system can on no account be derived from practical constraints alone, even if it must be recognized that, in the creation of systems, a not inconsiderable importance must be attached to restrictions due to the laws of nature, system structure and behaviour patterns.

If we restrict our considerations to a particular cultural system, the organi-

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zational structure of companies, it can be maintained that the contingency approach of organizational theory attempts to explain organizational structures primarily on the basis of different system structure and behavioural restrictions. Factors are sought which are compatible or not compatible with organizational parameters (Burns and Stalker, 1961; Woodward, 1965; Lawrence and Lorsch, 1967; Khandwalla, 1972; Child, 1972a; Pugh and Hickson, 1976; Kieser and Kubicek, 1976). Compatibility means agreement with regard to one criterion.

The contingency approach generally compares the frequency of occurrence of system elements, as in the question of whether a certain degree of formalization tends to exist in larger companies rather than in smaller ones. The criteria for the evaluation of compatibility of the system elements, size and formalization, are only introduced implicitly when attempts are made to *explain* the empirically determined interrelationships. In this example, the explanation lies in the different coordination costs as effects of formalization under various environmental conditions. In large companies, the coordination costs per employee arising from formalization are much lower than those in small companies. On the other hand, the coordination costs per employee in small companies are obviously smaller where personal directives are given as a possible variant of the organizational structure.

Consequently, the aim of a comprehensive contingency approach must be to consider simultaneously contextual factors, organizational structures and effects in order to answer the questions:

(1) What effects do different organizational structures have in the same environments?

(2) What effects do the same organizational structures have in different environments?

That the empirical treatment of these questions has hitherto been inadequate is probably due to the empirical problems which accompany this particular multivariate approach. Here, not just *one group* of environment variables (independents) is considered with regard to *one* organizational variable (dependent), as is possible, for instance, with the regression analysis (Child, 1973; Poensgen and Hort, 1981): this does not demand a very large number of available cases. On the contrary, three variables (groups) are brought into mutual relation and even with a sample size in excess of approximately 200 cases, [1] still only very simple statements are possible.

It is therefore not surprising that multivariate analyses in this sense are hardly conducted in studies with sample sizes of 7 to 82 cases (Zey-Ferrell, 1979, pp. 121 ff.). The only known approach which empirically and compre-

[1] In the case of a simple three-dimensional four-cell table (three dichotimized variables), a sample size of $n = 80$ is required in order to obtain an expectation of $n_{ij} = 10$ for each table cell where the three variables are completely independent.

hensively interrelates situation parameters, an organization parameter and effects, namely the Fiedler contingency model of leadership, was developed over a period of 20 years on the basis of a large number of studies (Fiedler, 1967) and, even so, has considerable weaknesses (Graen et al., 1970; Mitchell et al., 1970; Hill, 1969). This shows what efforts are required to derive informative statements on system structure and behavioural restrictions on the one hand and design scope on the other, given the large number of known environmental factors, organizational characteristics and effects.

In view of these difficulties our considerations must also naturally be limited to an extraordinary degree. Consequently, only a section – the organizational structuring of planning systems – is examined, not the whole organization of the company. This, however, makes it possible to examine in a relatively detailed manner the individual organizational structuring parameters in the form of qualitative variables.

The first aim of our work is, therefore, the compilation and operationalization of the structure dimensions of the planning organization which define the scope of structuring alternatives for the designer (see section 3; full details in Szyperski and Müller-Böling, 1980).

When the restrictions due to the laws of nature, system structure and behaviour patterns are ignored, the structure alternatives result as a combination of the number of basic structure parameters and the values of the variables inherent in them. However, in reality, certain patterns of organizational combinations are selected on account of the restrictions on the one hand and the full use of design scope on the other. In scientific work an important step towards a reduction in complexity is 'the recognition of characteristic patterns of structuring solutions which are particularly widespread in reality.

Consequently, the second aim of this work is to explore those types of organizations of planning which, as combinations of structuring elements or structure dimensions, show many similarities within the types but clear distinctions between the types (see section 4; detailed in Fürtjes and Müller-Böling, 1980).

Thirdly, the question of the system structure and behavioural restrictions is to be taken up on the basis of the available empirical findings in order to obtain first indications as to the practical constraints and scope of action (Schreyögg, 1980) in the organizational structure of planning systems (see section 5).

2. Characterization of the empirical study

The empirical study which forms the basis of this work was conducted in 1979 in the form of a survey of a total of 165 top managers. Statements were made on the environment, structuring and effects of a total of 360 planning systems so that the sample covers 360 cases.

The companies involved were in the Federal Republic of Germany, Austria and Switzerland, with the vast majority coming from the Federal Republic of Germany. The size of the companies varies from 160 to 333 000 employees with an annual turnover of between DM 12 million and DM 225 000 million (world-wide). However, smaller firms with up to 1000 employees (12%) and annual turnovers of up to DM 100 million (10%) are clearly under-represented in the sample. There was no bias towards any particular industry. Production companies, e.g. microelectronics and steel production and processing, are represented, as well as mining companies, energy producers and companies in the service industries.

3. A frame of reference for planning organization

Planning as a management function must also be planned, organized and controlled. The organizational structure of planning systems is then developed in accordance with an extended contingency approach with respect to the best combinations of

- environmental factors,
- planning philosophies, and
- desired or undesired effects.

(Keppler et al., 1979; cf. fig. 1).

3.1. Structure dimensions of planning organization [2]

3.1.1. Plan system

As planning for the whole company is too expensive and complex, it is specialized within the framework division. The work division structured around the *planning object* leads to the compilation of different subplans in the company. Specialization based on specific activities within the planning process leads to different separate activities such as gathering information, condensation, evaluation and approval of plan drafts (see below). Plans can be classified according to: planning horizon, i.e. the duration of validity; the problem level, i.e. devotion of attention to operative or strategic problems; and the planning object, i.e. restriction of content to sales, financing, investment or production problems.

The subplan is of fundamental importance for the following structural parameters since it is assumed that the use of planning instruments is structured differently for sales plans than for cost plans. This fact influences the

[2] Compare fig. 2 below.

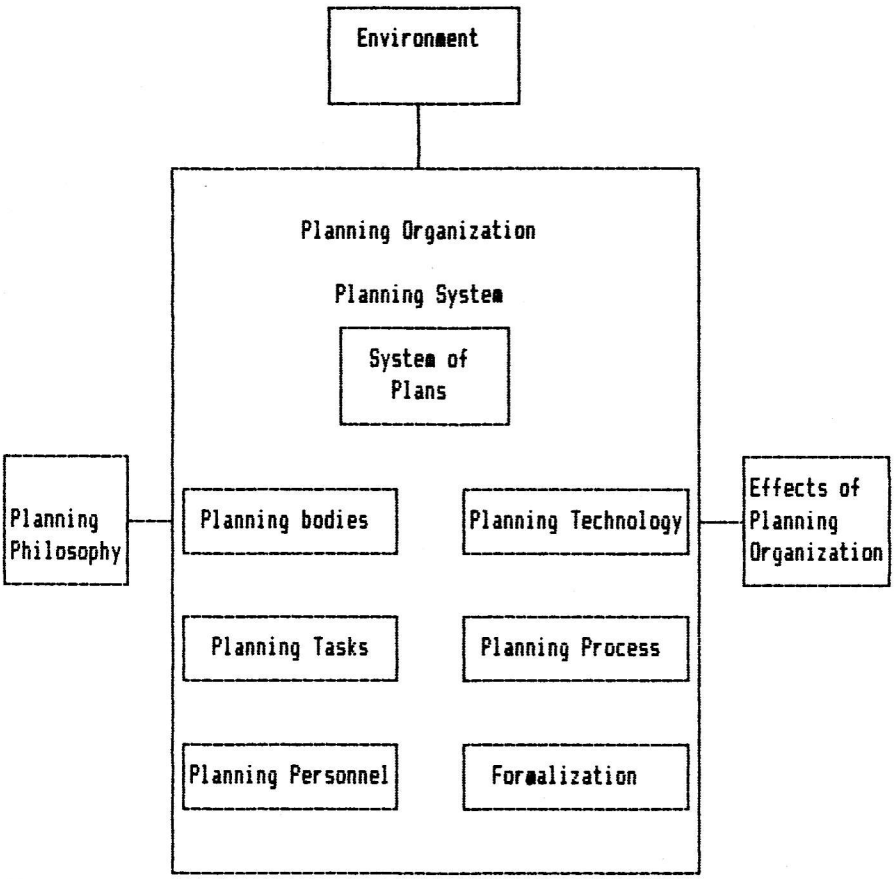

Fig. 1.

design considerations in as much as it is assumed that, in the boundary case, the company has as many different organizations of planning as (sub)plans.

3.1.2. Planning bodies

Alternatives with respect to planner activities are discussed within the "planning bodies" structural parameter. This involves the basic *selection of planners* and their *commitment to the company organization,* independently of the individual tasks within the planning framework.

3.1.3. Planning tasks

Separate planning activities are an indication of work division structured on the performance of *specific activities* within the planning process. Basically, distinctions must be made between three groups of planning tasks (table 1).

These three groups can be perceived with different *intensities*. Furthermore, these tasks must be delegated to different planning bodies. Thus, varying degrees of *planning body involvement* and varying *planning intensities* of the individual planning bodies provide the structuring possibilities.

3.1.4. Planning technology

Planning technology covers the methods, models and procedures which are used within the planning framework. One structuring parameter in this context is the *selection of planning instruments* and their application intensity in the different information processing steps of information gathering, information processing, information presentation, information evaluation and creativity. Furthermore, the type and degree of *EDP use* provide structuring possibilities.

3.1.5. Planning process

The procedural nature of the task is of particular importance for the organizational structure of the planning function. The planning process struc-

Table 1

Function	Task
(1) Planning function	Tasks involving the planning of material content and substance. These range from information processing to the formulation of alternatives and ratification of plans.
(2) Technical function	Service tasks in planning. These extend from the provision of suitable planning technology to the construction and maintenance of data banks.
(3) Management function in the planning process	Tasks in planning, organization and controlling the planning process in the sense of a meta planning, drafting of regulations for planning and motivating employees to plan.

DIMENSIONS	SUBCRITERIA/INDICATORS
PLAN SYSTEM	Planning horizon
	Level of planning
	Plan object
PLANNING BODIES	Selection of planning bodies
	Commitment to the overall organization
PLANNING TASKS	Content of planning tasks
	Intensity of planning task completion
	Assignment of planning tasks to planning bodies
	Participation in the planning process
PLANNING TECHNOLOGY	Planning instruments
	Use of EDP
PLANNING PROCESS	Planning impetus
	Deadlines in the planning process
	Sequential ordering of plans
	Directional derivation of plan (top-to-down, bottom-up)
	Mechanism for resolving conflicts
FORMALIZATION	Formalization instruments
	Formalization objectives

Fig. 2. Structural dimensions of planning organizations.

turing parameter takes this into account by combining a series of aspects relating to content. In addition to differentiating between *planning impetuses,* differentiations must be made between *deadlines* based on the degree of readiness of the plan, the *sequential ordering of the plans,* the *derivation direction* and the *mechanisms for resolving conflicts.*

3.1.6. Formalization

Written specification of regulations on the above-mentioned structuring parameters is also a variable parameter. It focuses on two points: on the one hand it provides considerable scope for employing alternative *formalization instruments* (job description, file memoranda, planning manuals, etc.), whilst on the other hand the *formalization contents* and the associated degree of formalization, representing the extent of written specification, can also be varied.

3.2. Environment factors in planning organization

Generally, the variables cited as environmental factors in planning organization are also quoted in discussions on the contingency dependency of organizational structures as a whole:

(1) Company size (Töpfer, 1976; Cetron and Ralph, 1971; Weinwurm and Weinwurm, 1971; Bacon, 1971; Poensgen and Hort, 1981).

(2) Sector (Töpfer, 1976; Polishuk, 1971; Cetron and Ralph, 1971).

(3) Ownership statuses (Töpfer, 1976; Budde, 1979; Poensgen and Hort, 1981).

(4) The organizational structure of the company (Miller, 1967; Henry, 1967; Töpfer, 1976).

3.3. Planning philosophy

Under the term "planning philosophy" we understand the implicit orientation and value models employed by planners, which influence their thought and action with respect to planning organization. Philosophies lead to behavioural restrictions in the structuring of systems (Hage and Dewar, 1973; Thompson, 1967). A series of empirical studies showed that planning philosophies represent individual traits or, at least, as collective values, i.e. as the planning philosophy of the company can only be surveyed with difficulty (Szyperski and Müller-Böling, 1979). For this reason, empirical findings on the relationship between planning organization and planning philosophy are not available. However, reference should at least be made to it as an essential component of the frame of reference.

3.4. Effects of planning organization

The structuring of a planning system and the development of its structure are aimed at fulfilling specific purposes; since the idea of employing planning organization is to attain a goal. A "good" planning organization cannot be an end in itself because, in the final analysis, planning organization also has to serve the goals of the company. However, it is difficult to estimate the extent to which planning organization is able to contribute to attainment of company goals. Planning as a management function represents only a subsystem in the overall management system. It is even difficult to prove its contribution to company success (Poensgen and Hort, 1981, p. 4).

Furthermore, planning organization refers only to a single aspect of the planning system. It therefore appears more appropriate to ask about the effects of specific planning organizations. These effects can then be evaluated with

regard to *desired* and *undesired* effects. One possibility lies in the acquisition of subjective assessments from the planners involved. This evaluation reflects the *satisfaction with the planning system.* The *deviations from planning targets* are also indicative of the effects of planning organizations, whereby both large and small deviations may be desirable. Small deviations can indicate that planning is modest in scale, whilst large deviations can be the result of venturesome planning. Which effects can be viewed as desirable ought therefore to depend, amongst other factors, on the management's willingness to take risks.

4. Types of planning organization

The second aim of the study was to check, on the basis of the planning organization variables developed in the previous section, whether typical patterns emerge in reality in the structuring of planning systems. With the aid of a hierarchical cluster analysis (Ward, 1961) utilized in conjunction with iterative methods (Wishart, 1978, pp. 43 ff.), homogeneous groups were formed which differ distinctly from one another. The grouping of a total of 42 variables as indicators of the structuring parameters of planning bodies, planning tasks, planning technology, planning process and formalization discussed above, led to 8 clusters, which are to be characterized in the following way (cf. table 2): [3]

Type 1: Controller-oriented planning organization ($n = 42$).

With respect to the allocation of planning tasks, the 42 forms of planning organization combined in this group are characterized by a strong concentration of planning on the *controller*. The dominance of the controller is underlined by very high intensities of planning both with respect to tasks concerning planning contents as well as with regard to tasks concerning the technical and the management functions in the planning process, accompanied by very low values for other special planning bodies (such as centralized and decentralized planning departments, committees and planning agents). With this type of organization the *managers* are noticeably relieved of management tasks in the planning process.

The utilization of *planning procedures* is average. A slightly above-average number of procedures and models is used merely for presentation and evaluation of planning information. *EDP* is used in 79% of cases – thus slightly more frequently than on average – for providing planning support. Further characteristics of this organization type are a slightly above-average frequency of

[3] Due to numerous missing values, the size of the sample is reduced to $n = 290$.

Table 2
Types of planning organization

	Designation	Planning bodies Planning tasks	Planning technology	Planning process	Formalization
Type 1 $n = 42$	Controller oriented planning organization	Predominantly controller	Frequent EDP support	Conflict-solving rarely in group	
Type 2 $n = 41$	Less formalized planning organization with less instrumental support in planning	Planning agent in conjunction with managers	Little use of planning instruments; below-average EDP support	Plan corrections are approved; frequent block planning; conflict-solving seldom in group	Lower degree of formalization
Type 3 $n = 39$	Bottom-up-oriented planning organization with decentralized planning departments	Decentralized planning departments in conjunction with centralized planning departments	Below-average number of presentation instruments; below-average EDP support	Rolling planning; extreme bottom-up approach; long plan preparation	
Type 4 $n = 73$	Planning organization with centralized planning department and little use of planning instruments	Centralized planning department	Little use of planning instruments	Relatively high proportion of block planning; conflict solving via superordinate authorities; short plan preparation	

Type 5 $n = 24$	Participative organization of planning	Planning committee in conjunction with managers and planning departments		Rolling planning; long plan preparation; conflict-solving via discussion and planning group	
Type 6 $n = 38$	Highly formalized planning organization with intensive instrumental EDP support in planning	Central planning department in conjunction with managers and top management	High use of planning instruments; above average EDP support	Rolling planning; bottom-up tendency	Extremely high degree of formalization
Type 7 $n = 19$	External oriented planning organization without plan corrections	External planners in conjunction with planning agent	High use of planning instruments; below-average EDP support	Plan corrections are rejected; rolling planning; top-to-down tendency	High degree of formalization
Type 8 $n = 14$	Manager-oriented organization of planning	Managers vs. top management	Tendency towards less use of planning instruments; below-average EDP support	Plan corrections are approved; rolling planning and project plans; top-down tendency; no conflict; extremely short plan preparation	Extremely low degree of formalization

block planning and only low utilization of mechanisms for solving *conflicts* in a planning group.

Type 2: Less formalized planning organization with low utilization of planning technology ($n = 41$).

This type of planning organization is characterized by a high intensity of planning by the *planning agent*. The *executive managers* are also involved to an above-average degree in the planning process with respect to technical and management functions. The planning activities of *top management* are largely concentrated on planning management. Top management is only involved to a comparatively low extent in the substance of planning and in the technical function of the planning process. Other planning bodies hardly play a role. Decentralized planning departments are not present at all in the planning organizations combined in this class. The application of *planning instruments* occurs only to a very small extent. Creativity techniques are generally not employed. In addition, only very few methods are applied for processing and evaluating information.

The use of EDP in providing planning support is still relatively rare. In the current planning year, *plan corrections* using this type are approved in 61% of cases, i.e. relatively frequently. Furthermore, unlike with all other groups, planning here is more frequently conducted according to the system of *block planning* than to the system of *rolling planning*. The planning direction (derivation of the plans occurs) is more from *bottom to top*.

Attempts at solving *conflicts* arising during planning mainly take the form of discussions between the parties directly involved. On the other hand, conflict-solving by engaging a planning committee seldom occurs.

Finally, a characteristic feature of this group is a very low degree of planning *formalization* overall. Not only are relatively few formalization instruments used, but the number of written planning regulations is also relatively low.

Type 3: Bottom-up-oriented planning organization with decentralized planning departments ($n = 39$).

The third group is characterized by a high planning intensity of *decentralized planning departments*. High intensity values reflect a high interrelational complexity of these organizational units in the various planning tasks. The decentralized planning departments are supplemented by a centralized planning department, which particularly looks after planning management tasks. The existence of these bodies specialized in carrying out planning tasks is in some cases associated with *top management* and the *executive managers* being relieved quite considerably of technical and management functions in the

planning process, and also with above-average involvement in tasks relating to planning content. Further features of this type of organization are an intensive *utilization of instruments* for gathering and processing information relevant to planning and a below-average *use of EDP* in the planning framework. With respect to sequential ordering of plans, the system of *rolling planning* clearly dominates here. Project planning is hardly carried out at all. This type closely approaches the total *bottom-up approach,* whereby the subplans are prepared initially at lower management levels and subsequently combined to form higher-level plans. In almost every case, initial efforts to *resolve conflicts* take the form of discussions between the parties directly concerned. However, other alternatives for conflict-solving are also used. The *planning period* for this group is relatively long. The values for planning *formalization* are slightly above average.

Type 4: Planning organization with centralized planning department and little use of planning instruments ($n = 73$).

Seventy-three cases represent the type of planning organization where the *centralized planning department* plays a dominant role in the planning framework. Extremely high values for the intensity of planning by the centralized planning department and relatively low intensities of planning by other planning bodies indicate that planning is largely in the hands of the centralized planning department. Even top management and executive managers are involved in planning to a clearly lesser extent than is otherwise customary. The utilization of *planning technology* is very low on the whole, as was the case with type 2. In particular, relatively few methods are used for information processing and evaluation as well as for innovation. On the other hand, the use of *EDP* for providing support in planning tasks is encountered relatively rarely with this group. With regard to the sequential ordering of plans, block planning is employed to an above-average degree with this organization type. With regard to procedures for *resolving conflicts*, it is noticeable that superordinate authorities are quite frequently called upon to resolve conflicts. Concentration of planning on one organizational entity is associated with a very short planning period of 2.7 months.

Type 5: Participative planning organization ($n = 24$).

Planning organizations of this type are characterized by a high involvement of *planning committees* in the various planning tasks. Particularly noticeable here is the dominant position of planning committees with respect to planning function. But *decentralized planning departments, centralized planning departments* and *managers* are also involved to an above-average degree in determining the planning content. In addition to the planning committees, decentralized

planning departments and the parent company are concerned to an above-average degree with the technical function in the planning process. Planning management tasks are assumed to a notable extent by both planning committees and centralized planning departments as well as by executive managers and top management. All in all, it can be stated that with this organization type planning is not predominantly the task of a few planning bodies as with the other groups; instead, a large number of bodies are equally involved in planning via the planning committee. The use of *planning instruments* is relatively small in the information processing and innovation sectors. The values for other information processing tasks are average, with slightly below average values being registered when *EDP support* is employed for planning. The system of *rolling planning* is clearly given preference here to block planning. Project planning is also met with quite frequently. This group closely approaches the *countercurrent principle,* whereby the plans are prepared in a constant feedback process between the various hierarchical levels. With respect to the *mechanism for resolving conflicts,* it is noticeable that, in addition to the discussion between parties directly concerned, central significance is attributed to resolving conflicts by means of discussion in a planning group, something which has not been observed in any other group. This distinctive feature underlines the impression already gained in the analysis of the planning intensities of various planning bodies that this type of planning organization is more participant-oriented. The relatively high decentralization of planning, however, also has the longest *planning period* when compared to the other groups. An average of 5 months pass from the time planning commences to the time the plan is approved.

Type 6: Highly formalized planning organization with intensive instrumental support in planning ($n = 38$).

As with type 4, this group of planning organization is characterized by high intensities of planning by the centralized planning department. Unlike type 4, however, the existence of a *centralized planning department* does not relieve *top management* and the *managers* from planning tasks to any considerable degree; instead, the managers are involved in an above-average number of subplanning activities. Top management, too, still displays average intensity values with respect to planner and management functions in planning processes. Other planning bodies no longer play any notable role in planning organizations of this type. A further characteristic feature of this group is an extremely marked utilization of *planning technology* in *all* information processing tasks. The intensity values for the degree of utilization of planning instruments are not even approached by any other group. *EDP support* in planning is also on a quite high level. In 84% of cases, subplanning tasks are carried out with the aid of EDP. Rolling planning clearly dominates. It is possible to observe a slightly

above-average trend towards the bottom-up approach. In comparison to group 4, superordinate authorities play only a subordinate role in *resolving conflicts*, whilst planning groups play a considerable more significant part. Very high *formalization values* – not attained by any other group – indicate the necessity of written coordination specifications with high utilization of planning instruments and the involvement of a high number of bodies in the planning process.

Type 7: Externally-oriented planning organization without plan corrections ($n = 19$).

With planning organizations of this type, the *parent company* is highly involved in planning. The parent company is particularly involved in planning management tasks. However, *planning agent* and top management also assume many tasks relating to the management planning function. On the other hand, managers, centralized and decentralized planning departments, planning committees and controllers play no notable role in planning control. Planning the content lies largely in the hands of the planning agent. Furthermore, only the parent company and top management assume planner function tasks to any notable extent. The parent company and planning agent also largely assume the technical function in the planning process.

A further characteristic of this group is a well above-average utilization of *planning technology*. The intensity values are only exceeded by the planning organizations in group 6. *EDP support* is, on the other hand, relatively undeveloped. In 47% of cases, EDP is not yet used in the planning framework.

A particularly striking feature of this organization type is that, in 84% of cases, a correction of the plan is always rejected during its period of validity. In almost all cases of this type the planning target is valid over the entire planning period.

As far as the sequential ordering of the plans is concerned, the system of *rolling planning* dominates even more clearly than with types 3, 5 and 6.

The group tends very distinctly towards the *top-to-down approach.* Conflicts are resolved predominantly via direct discussions between the parties affected. Superordinate authorities are called in only very rarely. In addition, these planning organizations are characterized by a relatively high degree of planning *formalization*. Only the cases in group 6 display an even higher level of formalization.

Type 8: Manager-oriented planning organization ($n = 14$).

In the case of the 14 planning organizations combined in this group, planning is carried out almost exclusively without special planning bodies. Extremely high intensities of planning by *top management* indicate that this body is involved in the various planning activities to an unusually great extent.

Executive managers too are involved in planning to an extremely high degree. With the exception of the planning agent, who still achieves average values with respect to the planner functions and technical functions in the planning process, other specific planning bodies do not play a notable part. In general, *planning instruments* are used only on a relatively small scale. Creativity techniques are hardly ever used for supporting the innovation process. On the other hand, EDP support in planning is employed to an average degree. In a similar way to type 2, plan corrections are approved relatively frequently during the application period of the plan. Only in 36% of cases are premature plan corrections rejected as a matter of principle. In addition to plans which are interconnected with respect to time, according to the system of *rolling planning, project plans* are also frequently prepared. Similar to type 7, these planning organizations tend more towards the *top-to-down approach*. This is not surprising if the extremely high intensities of planning by top management are brought to mind. It is noticeable with respect to *resolving conflicts* that discussion between the parties concerned is selected relatively rarely here and that superordinate authorities are practically never called upon. One of the main reasons why only few mechanisms for resolving conflicts are used is concerned with the obviously very low conflict awareness of this group. It was stated in 36% of cases that no conflicts arise within the planning framework. In this respect, this group differs considerably from the other seven where the occurrence of conflicts was not denied in any group. Further striking features of these planning organizations are that they have the shortest *planning period* and an almost total lack of *written planning regulations.*

5. Effects of planning organizations in various environments

5.1. Planning organizations in various environments

Below we investigate which alternative structures are selected more or less frequently in specific situations. In order to be able to establish trends, discussions will be restricted in each case to percentual differences of at least 10 points (column percentages against sum-of-row percentage; an exception is table 3: row percentages against sum-of-column percentage). According to our design considerations laid out above, the subplan, which forms the basis of the planning organization, is a major influencing variable for structuring the planning system.

5.1.1. Plan

Due to the low frequencies for ten different plans and eight types of planning organization, statistically clear relationships cannot be established. If

Table 3
Relationship between plans and use of planning technology

Use of various planning technologies				
Plan	Low	Average	High	Sum
Production plan	9 (64)	2 (14)	3 (21)	14 (100)
Sales plan	6 (15)	22 (55)	12 (31)	40 (100)
Personnel plan	11 (55)	3 (15)	6 (30)	20 (100)
Investment plan	27 (57)	14 (30)	6 (13)	47 (100)
Finance plan	11 (48)	7 (30)	5 (21)	23 (100)
Cost plan	13 (48)	9 (33)	5 (19)	27 (100)
Profit/loss plan	30 (47)	24 (38)	10 (16)	64 (100)
Corporate plan	17 (21)	33 (41)	30 (38)	80 (100)
Strategic plan	4 (16)	8 (32)	13 (52)	25 (100)
Miscellaneous	10 (50)	5 (25)	5 (25)	20 (100)
Sum	138 (38)	127 (35)	95 (26)	360 (100)

the individual structuring parameters for planning organizations are considered separately, it can be seen that the plan object is clearly related first and foremost to the form of the planning technology parameter, i.e. the selection of the planning technology and the intensity of its application is clearly dependent upon the planning object.

The findings given in table 3 show that planning instruments are applied on a relatively low intensity level in production, personnel, investment, financial, costs and profit/loss plans. Different reasons are quoted for this. Whereas, from a practical point of view, few instruments seem to be necessary in drafting production, investment, financing and cost plans, the reason for the low application of planning instruments for personnel plans is, first and foremost, to be found in the lack of experience with planning instruments on the part of personnel managers (Drumm and Scholz, 1986). Corporate plans and strategic plans, on the other hand, are prepared with an above-average number of planning technologies. The conclusion can be drawn from these findings that clear solution patterns exist in the case of well-defined planning problems or problems with which companies traditionally already have a great deal of experience (investment, finance and accounting) and that such stock solutions lead to the application of a smaller number of planning instruments. On the other hand, a relatively high number of planning instruments are used for poorly structured problems or for problems with which companies have previously had relatively little experience (corporate plan, strategic plan). The sales plan assumes an intermediate position in this respect. For this reason, an average degree of utilization is particularly frequent here. A relationship between the plan object and the selection and allocation of planning bodies, the form of the planning process and the formatization could not be estab-

Table 4
Relationship between size of company measured by employees and types of planning organization

Employees	Type															
	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8	
Up to 1000	3	(7)	9	(23)	1	(3)	6	(8)	1	(4)	6	(17)	3	(16)	7	(50)	36	(13)
From 1000 to 3000	21	(50)	20	(50)	2	(5)	21	(29)	7	(30)	12	(33)	4	(21)	6	(43)	93	(33)
From 3000 to 10000	13	(31)	10	(25)	6	(15)	28	(39)	8	(35)	9	(25)	3	(16)	1	(70	78	(27)
Over 10000	5	(12)	1	(3)	30	(77)	17	(24)	7	(30)	9	(25)	9	(47)	0	(0)	78	(27)
	42	(100)	40	(100)	39	(100)	72	(100)	23	(100)	36	(100)	19	(100)	14	(100)	285	(100)

lished. It therefore appears that these planning organization dimensions are structured independently of the plan object.

5.1.2. Size of companies

In contrast, the types of planning organization are not distributed at all evenly over the individual company size classes (cf. table 4). Thus, types 1, 2 and 8 clearly occur more frequently in companies with up to 3000 employees (with the exception of type 1 in companies with up to 1000 employees); types 3 and 7 are more likely to be encountered in companies with over 10000 employees.

Types 4 and 6, on the other hand, rather tend to be neutral as regards size, i.e. their proportionate distribution is the same in all size classes. Type 5 is particularly rare in small companies with less than 1000 employees, but is evenly represented in larger companies. An almost identical picture emerges if turnover is taken as the criterion for company size (cf. table 5). Once again, types 1, 2 and 8 are represented with above-average frequency in companies with turnovers up to DM 500 million, whereas types 3, 5 and 7 are highly concentrated on large companies with more than DM 1000 million turnover.

A common feature of types 2 and 8 is that they display a low formalization of the planning organization. This finding coincides with the knowledge that the degree of formalization is influenced by the size of company, since larger organizations tend to satisfy their coordination requirements by employing formal coordination instruments (with reference to organization, see Blau and Schoenherr, 1971, pp. 381 f.; Pugh et al., 1969; Child, 1972b; with reference to planning, see Bacon, 1971; Poensgen and Hort, 1981, p. 14).

Type 3, which occurs with greatest frequency among large companies, is characterized by decentralized planning departments with a marked bottom-up orientation. Large companies tend to be decentrally organized and also require

Table 5
Relationship between size of company measured by turnover and types of planning organization

Turnover (mill. DM)	Type															
	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8	
Up to 100	1	(2)	4	(10)	1	(3)	6	(9)	2	(9)	3	(8)	0	(0)	5	(36)	22	(8)
From 100 to 500	28	(67)	25	(63)	0	(0)	31	(44)	5	(23)	15	(40)	8	(42)	8	(57)	120	(42)
From 500 to 1000	5	(12)	7	(18)	1	(3)	9	(13)	3	(14)	4	(11)	1	(5)	0	(0)	30	(11)
Over 1000	8	(19)	4	(10)	37	(95)	24	(34)	12	(55)	16	(42)	10	(53)	1	(7)	112	(39)
	42	(100)	40	(100)	39	(100)	70	(100)	22	(100)	38	(100)	19	(100)	14	(100)	284	(100)

their own special planning bodies for the independently acting entities. The alternative to the decentralized solution of type 3 is represented in the case of very large companies by type 7, which is characterized by very high involvement of the parent company in the planning and by a high level of formalization. The participative planning organization (type 5), where a large number of planning bodies work together in a planning committee, should, therefore, be regarded as being under-represented in the companies with less than 1000 employees, because special planning bodies occur less frequently in these companies. Types 4 and 6, which appear to be neutral with respect to size, are both characterized by the high involvement of a centralized planning department, whereby the difference lies in the lesser utilization of planning technology (type 4) and a higher degree of formalization (type 6).

Consequently, centralized planning departments are selected independently of the size of the company. Further structuring, for example with respect to the application of planning instruments, is then dependent upon other factors, such as the plan object.

Table 6
Relationship between organization forms and types of planning organization

Organization form	Type															
	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8	
According to functions	28	(67)	20	(49)	8	(21)	30	(41)	7	(29)	21	(55)	8	(42)	10	(71)	132	(46)
According to divisions	3	(7)	7	(17)	10	(26)	17	(23)	5	(21)	5	(13)	3	(16)	1	(7)	51	(18)
Matrix organization	11	(26)	14	(34)	21	(54)	20	(27)	11	(46)	9	(24)	8	(42)	2	(14)	96	(33)
Others, e.g. regions	0	(0)	0	(0)	0	(0)	6	(8)	1	(4)	3	(8)	0	(0)	1	(7)	11	(4)
	42	(100)	41	(100)	39	(100)	73	(100)	24	(100)	38	(100)	19	(100)	14	(100)	290	(100)

5.1.3. Organizational form of the company

As far as the organizational form of the overall company is concerned, only a few trends can be worked out, which, however, support the findings already discussed above (cf. table 6). Controller-oriented (type 1) and manager-oriented planning organizations (type 8) fall primarily into the group of functionally organized companies. Bottom-up-oriented planning organizations with decentralized planning departments (type 3) and also participative planning organizations are encountered predominantly in divisional or matrix organizations, but relatively rarely in functionally organized companies. The remaining types of planning organization, types 2, 4, 6 and 7, are distributed proportionately over the individual organizational forms, which means that these types can be assumed to be independent of the organizational structure of the company.

5.1.4. Ownership statuses and legal form

The findings concerning ownership statuses and legal form complete the picture obtained thus far concerning environmental contextual factors (cf. tables 7 and 8). Types 1 and 8, which were encountered particularly frequently in small and medium, functionally organized companies, are now found especially often in companies owned by one or a number of private individuals (family), whereas type 8 very frequently occurs in the legal form of the limited liability company. The bottom-up-oriented planning organization (type 3) is highly concentrated on corporations in common ownership, whereas type 7, in which a parent company dominates, tends to occur in majority-owned enterprises in companies with limited liability.

As this analysis of environmental contextual factors shows, very clear

Table 7
Relationship between ownership statuses and types of planning organization

Ownership status	Type															
	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8	
Private ownership	21	(51)	10	(26)	4	(10)	24	(33)	4	(17)	10	(26)	3	(16)	12	(86)	88	(31)
Common ownership	5	(12)	6	(16)	20	(51)	9	(13)	4	(17)	6	(16)	4	(21)	0	(0)	54	(19)
Majority ownership	12	(29)	17	(45)	12	(31)	33	(46)	12	(50)	18	(47)	12	(63)	2	(14)	118	(41)
Public ownership	3	(7)	5	(13)	3	(8)	6	(6)	4	(7)	4	(11)	0	(0)	0	(0)	25	(9)
	41	(100)	38	(100)	39	(100)	72	(100)	24	(100)	38	(100)	19	(100)	14	(100)	285	(100)

Table 8
Relationship between legal form and types of planning organization

Legal form	Type															
	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8	
Companies with personal liability	1	(2)	4	(10)	1	(3)	7	(10)	2	(8)	1	(3)	0	(0)	2	(14)	18	(6)
Companies with limited liability	17	(41)	17	(42)	1	(3)	25	(34)	5	(21)	14	(37)	12	(63)	11	(79)	102	(35)
Corporations	24	(57)	20	(49)	37	(95)	37	(51)	16	(67)	19	(50)	7	(37)	1	(7)	161	(56)
Public concerns and associations	0	(0)	0	(0)	0	(0)	4	(6)	1	(4)	4	(11)	0	(0)	0	(0)	9	(3)
	42	(100)	41	(100)	39	(100)	73	(100)	24	(100)	38	(100)	19	(100)	14	(100)	290	(100)

environments occur in the case of types 1 and 8 (small to medium, functionally organized companies in private ownership) as well as 3 (large companies with matrix or divisional organization in the legal form of non-controlled corporations), whereas other types of planning organization, particularly those with dominant centralized planning departments, appear to be environmentally independent.

5.2. *Effects of planning organizations*

The following will be discussed as constituting the effects arising from planning organizations:

(1) The self-appraisal of company planners with regard to the strengths and weaknesses of their planning organization in the form of a total of 19 statements combined to form an index.

(2) The deviations of the result from the planned target expressed as a percentage.

Both values were dichotomized at the empirical mean. For (1), this yielded the groups of cases satisfied and dissatisfied with the planning organization. For (2), this yielded a group with low deviations from the planned target of up to 4.5% and a group with high deviations from the planned target of between 4.5% and a maximum of 65%. Attention was drawn earlier to the fact that low deviations from planned targets are not necessarily positive in their effect.

Apart from three exceptions, the ratio of satisfactory cases and unsatisfactory cases for the individual types is approximately 50 : 50 with respect to overall distribution. Clear deviations from the expectation value of 10 percentage points and above only occur with types 1, 7 and 8 (cf. table 9).

Thus, there is a 61% tendency towards dissatisfaction with controller-oriented planning (type 1), whereas for line-oriented planning (type 8) there exists, with 91%, a strong tendency towards satisfaction.

Table 9
Relationship between satisfaction with planning organization and types of planning

Strengths and weaknesses evaluation	Type															
	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8	
Dissatisfied	23	(61)	21	(58)	19	(49)	29	(44)	12	(50)	21	(58)	5	(28)	1	(9)	131	(49)
Satisfied	15	(39)	15	(42)	20	(51)	37	(56)	12	(50)	15	(42)	13	(72)	10	(91)	137	(51)
	38	(100)	36	(100)	39	(100)	66	(100)	24	(100)	36	(100)	18	(100)	11	(100)	268	(100)

Bearing in mind the fact that planning organization types 1 and 8 display great similarities with respect to environmental conditions, the divergent assessments are all the more significant. In the case of the target deviation analysis, the differences which can be established for the individual planning organizations are even smaller than is the case with the satisfaction levels (cf. table 10). Clear tendencies towards high target deviations are found only in types 2 and 4. The high proportion of block planning in these types of planning organization can be considered a satisfactory explanation for this finding. Block planning, where experience of previous planning periods can only be utilized to an unsatisfactory extent, tends to lead to unrealistic planning objectives and, thus, results in higher target deviations.

Overall, five out of eight types of planning organization appear to be neutral in effect with respect to satisfaction, and six out of eight types appear to be neutral in effect with respect to target deviation.

5.3. Effects in different environments

Therefore, the decisive question is whether these types of planning organizations achieve different effects in different environments. This question requires a multi-variate approach. Due to the limited number of cases, the data can only serve to provide cautious statements on trends. For this reason, we

Table 10
Relationship between planning target deviation and types of planning organization

Target deviation	Type															
	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8	
Low	14	(48)	12	(41)	13	(43)	20	(40)	10	(56)	13	(52)	7	(47)	6	(50)	95	(46)
High	15	(52)	17	(59)	17	(57)	30	(60)	8	(44)	12	(48)	8	(53)	6	(50)	113	(54)
	29	(100)	29	(100)	30	(100)	50	(100)	18	(100)	25	(100)	15	(100)	12	(100)	208	(100)

Table 11
Satisfaction with controller-oriented planning organization

	Total	Matrix Organization	Turnover growth −1% to +5%
Dissatisfied	23 (61)	4 (40)	7 (41)
Satisfied	15 (39)	6 (60)	10 (59)
	38 (100)	10 (100)	17 (100)

want to limit ourselves to findings which oppose the trends described in previous statements and are, therefore, particularly suitable for making distinctions in previous interpretations.

Controller-oriented planning organization (type 1) tends overall to be evaluated negatively. However, positive evaluations predominate with matrix-organized companies and companies with a growth of −1 to +5% (cf. table 11). Consequently, the controller-oriented type of planning organization is evaluated negatively first and foremost in an organizational structure organized according to functions – which is, however, where it occurs most frequently – whereas in a matrix context the evaluation tends to be positive. Similarly, satisfaction with this type of planning organization appears to be more likely in companies which are not characterized by sharp drops in turnover or great turnover shifts. Satisfaction with this type of organization is obviously more likely to prevail where static company conditions exist.

In the planning organization with a central planning department and low utilization of planning instruments (type 4), the number of positive and negative evaluations is more or less equal and is thus apparently neutral in effect. However, clear trends emerge if different environmental conditions are also taken into consideration. (Cf. table 12.) In stable, mildly successful companies with a turnover growth rate of up to 10%, there is a distinctly greater satisfaction with this type of organization than is the case with quickly expanding companies with a turnover growth rate of over 10%. This, therefore,

Table 12
Satisfaction with planning organization with centralized planning department and little use of planning instruments (type 4)

	Total	Turnover growth		
		1% to 10%	over 10%	over DM 1000 mill. turnover
Dissatisfied	29 (44)	11 (29)	9 (75)	12 (57)
Satisfied	37 (56)	27 (71)	3 (25)	9 (43)
	66 (100)	38 (100)	12 (100)	21 (100)

agrees with the previous finding and confirms that very large companies with this type of organization also tend to be evaluated negatively. It appears that, with a centralized planning department without great support from the managers and with low utilization of planning instruments, planners consider that resolving a planning task is more likely to be successful in a static company of small size. In other words, for a centralized planning department the ability to solve planning problems is limited to a manageable, not too complex environment.

6. Conclusions for organizational structuring of planning systems

This analysis of the effects of planning organizations in different environments, which is admittedly still very limited in its positive content, is at least able to illustrate a number of system structure and behavioural restrictions encountered in structuring planning organizations. However, the findings presented appear to indicate that the range of scope for action is disproportionately much greater. There are not very many cases in which specific effects, or even only trends, could be ascribed to planning organizations in specific environments. This may be due to weaknesses of the data available, the scope of which allows only a three-dimensional approach, which means that the environment is characterized in each case by one parameter only. On the other hand, of course, other effects also play a role in structuring planning organizations and these effects obviously lead to different types of organization being selected in the individual environments. However, only implicit conclusions can be reached as to the reasons for this and it is not possible to draw direct conclusions from the data material. Finally, we shall once again summarize the scope of action and restrictions with respect to structuring which we have investigated using our material.

6.1. Company size

First of all, the size of a company influences the degree of formalization of the planning system. Therefore, the more highly formalized types of planning organization types 6 and 7, come into question for larger-sized companies, whereas the less formalized form of types 2 or 8 is more likely for smaller companies. The size of the company also influences the possibilities of setting up specialized planning bodies. Planning organizations which rely very heavily on managers, such as types 2 and 8, are particularly relevant for small- and medium-sized companies. Type 3, on the other hand, where planning is carried out by decentralized planning departments, remains particularly restricted to larger companies, whereas type 5 with its numerous special planning bodies is

confined more especially to companies with less than 1000 employees. In the case of small to medium, functionally organized companies owned by a few individuals, the manager-oriented planning organization (type 8) is more highly appraised than the controller-oriented form (type 1). Dissatisfaction is expressed with type 4 in the case of very large companies and companies with high turnover growth rates.

6.2. *Organization form*

The more decentralized form of organizational solutions provided by types 3 and 5 meets the requirements of matrix or divisional organizations, whereas types 1, 6 and 8 appear suitable for functionally organized companies.

6.3. *Plan*

The planning organizations with low utilization of planning instruments, types 2, 4 and 8 appear suited for well-structured planning problems (investment, financial, production and cost plans), whereas firms with a high utilization of planning instruments, such as types 6 and 7, appear appropriate for poorly structured planning problems in strategic planning or corporate planning.

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