

A Multiobjective Approach and Empirical Application of Sales-Organization Design

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ABSTRACT

This paper addresses the critical issue of determining the appropriate structural design of a sales organization. We propose a new approach for organizing the selling function using multiobjective modeling techniques. The proposed approach considers the situational characteristics under which the sales organization operates, trade-offs among multiple sales-effectiveness criteria, and the "fit" between the situational characteristics and the structural dimensions (i.e., the structure-contingency relationships). Using data collected from sales branches of brokerage firms, we develop appropriate structural designs for a sales organization using the proposed procedure. The paper concludes by outlining the various decision-making implications of the approach.

Subject Areas: Goal Programming, Marketing Management, and Organization Development.

INTRODUCTION

In recent years, a substantial amount of research in the marketing literature has dealt with a diverse set of problems relevant to the selling function. This research has included empirical studies focusing on individual-level phenomena such as motivation, knowledge, and satisfaction of salespeople [7] [32], as well as the development of normative decision models for determining the optimal sales territory [33] [34], selecting appropriate compensation plans [17], estimating sales-force size, and allocating sales resources [19]. A fundamental concern that is critical to the effectiveness of the selling function is the issue of sales-organization design. Although the importance of this issue has been recognized by experts in the sales management literature [30] [34], it has received little theoretical or empirical scrutiny.

There are two aspects that arise when examining the question of sales-organization design. The first relates to whether internal employees or external salespeople (e.g., manufacturers' agents) should be used to perform the selling function, an issue that has been addressed using a transaction cost approach [2]. The second issue, which is the focus of this research, pertains to determining the appropriate structural form of a sales organization. In addressing the latter issue, however, there is a need to consider the environmental situation confronting a particular sales organization (since there is little management can do to alter the external conditions under which the sales force functions). Thus, it has been argued that the structural dimensions need to "fit" the specific situation facing the sales organization. Further, since effectiveness of the sales force is of primary concern, the impact of the structural form on multiple and conflicting effectiveness criteria also needs to be considered. Hence, the thrust of this research is to develop and empirically illustrate an approach for sales-organization design that considers all of these aspects.

The remainder of the paper is organized as follows. The next section discusses the critical issues in developing a procedure for sales-organization design. The proposed sales-organization design approach is then described, followed by an

illustration of the method through an empirical application. Finally, the decision-making implications of this research are discussed in the last section.

CRITICAL ISSUES FOR SALES-ORGANIZATION DESIGN

There are several issues that need to be considered in determining the appropriate structural form of the sales organization. These issues, which form the underpinnings of the proposed procedure for sales organization, are discussed below.

Structural Dimensions. The specification of key structural dimensions is of primary concern since the sales-organization design is characterized in terms of these dimensions. Although a number of diverse dimensions have been suggested, there is growing consensus in the organizational and marketing literature that the dimensions of formalization, centralization, and complexity are fundamental to understanding the structural form [9] [15] [21] [25]. In general, formalization refers to the existence and enforcement of rules, regulations, and/or procedures. Centralization reflects the locus of decision-making authority along the vertical dimensions of the sales organization (or the amount of participative decision making). Complexity refers to the extent of differentiation within a sales organization and can be characterized as vertical, horizontal, personal, or spatial [21].

While these structural dimensions are relevant for a general set of organizations, some of these dimensions may be less critical than the others for a specific sales organization. For example, formalization is likely to be less important to sales organizations operating in regulated industry since rules and procedures are specified by external agencies. Thus, the key structural dimensions should be identified based on whether they can be modified and/or altered as and when necessary.

Situational Characteristics. In determining the structural design of the sales function, some researchers have argued that environmental contingencies must be considered [7] [26]. Although a diverse set of situational factors have been identified, aspects such as external environment, selling activities, and resources available to the organization have emerged as critical [7] [32]. Complexity (i.e., the range of relevant components such as the types of competitors or customers) and dynamism (i.e., the change in these components) are the underlying dimensions that have been used to examine the effects of the external environment on the structural dimensions [10]. Characteristics that differentiate the diverse activities performed by salespeople are the degree of nonroutineness (i.e., the number of exceptions encountered in performing the sales activities) and interdependence (i.e., the extent to which the activities are interrelated) [12] [22]. Salesforce size has been identified as one of the major resource dimensions [16]. (While the causal status of size in relation to the structure is unclear, the view that size is exogenous in its relation to structure is currently dominant in the field.)

Although substantial empirical evidence exists to support the relationship between these situational characteristics and the structural dimensions [1] [13], some situational factors may be more relevant than others for an individual sales organization. For example, nonroutineness in the sales activities could have little effect on personal complexity for sales organizations handling standardized products. Thus, a key consideration in identifying appropriate situational characteristics is whether they are related to the relevant structural dimensions.

Aspects of Sales Effectiveness. When identifying a sales-organization design, its impact on sales effectiveness is of critical importance. This raises the question of the appropriate conceptualization of sales effectiveness. In the organizational and sales management literature, there seems to be little consensus regarding the

meaning of effectiveness or the best manner by which to assess it [3] [5] [18] [31]. In practice, a variety of sales outcome measures such as total sales, gross margin, contribution to profit, or market share have been used [14]. Since multiple criteria are more often relied on rather than a single criterion, a procedure for sales-organization design should consider several conflicting sales-effectiveness criteria and also incorporate, if necessary, the trade-offs between them.

Notion of Fit. Structure contingency theorists have argued that the situational characteristics of concern should be related to the structural dimensions when determining an appropriate structural form for an organization [24]. Hence, there needs to be a fit between the structural form and the situation. However, the question of whether the form of the fit (e.g., an increase in environmental complexity leads to an increase in formalization) should be prespecified needs to be addressed.

There are two major problems associated with such an a priori specification.

1. While there is substantial literature that documents the association between the situational and structural dimensions discussed earlier, there is conflicting evidence as to the specific form of these relationships. For example, in a meta-analysis of the relationship between the situational characteristic of interdependence and the structural dimensions, inconsistent findings emerged for the specific form of the relationship [12].
2. The form of the fit is also likely to vary depending on the effectiveness criterion under consideration. It has been argued that an organization typified by success on a particular effectiveness criterion is likely to have different structural characteristics than the same organization with success on another criterion [23]. For example, given a highly complex environment, when sales growth is of interest there is a need for a low level of formalization to give the sales force the flexibility to capitalize on the opportunities in the market. If efficiency (i.e., ratio of expenses to sales) is emphasized, higher levels of formalization ensure better control over resources and costs.

Thus, an approach for sales-organization design should be flexible enough to incorporate alternative forms of the fit between the structural dimensions and situational factors. In sum, when developing an approach for sales-organization design, this discussion suggests we need to incorporate a set of situational characteristics that account for the conditions under which the selling function is performed, identify a sales organization design given multiple and conflicting effectiveness criteria, and recognize that the structural dimensions need to fit the situational characteristics in which the sales organization operates but that the specific forms of these fits vary depending on the sales-effectiveness criteria under consideration.

AN APPROACH FOR SALES-ORGANIZATION DESIGN

This section of the paper describes the approach for determining the appropriate structural characteristics for a sales organization. The proposed approach is structured around a multiobjective goal programming model [28]. While these models have been used in a variety of settings [6] [29], they are particularly appropriate for the problem at hand since they consider user-defined priorities as well as target levels for the multiple-sales effectiveness criteria simultaneously. The discussion that follows describes each major step of the proposed approach.

The first and second steps of the approach focus on identifying the relevant structural dimensions and related situational characteristics, respectively, for the organization interested in developing an appropriate sales-organization design. The

M structural dimensions represent the decision variables and are defined by S_j ($j=1, \dots, M$). Since certain structural dimensions may be less important for a particular sales organization, it is important that only the relevant dimensions are included as the M decision variables. The K situational characteristics are represented by C_k ($k=1, \dots, K$) and consist of only those factors that impact the M structural dimensions. The specific values of these characteristics (v_k) reflect the situation under which a particular sales organization operates and are required as input parameters to be specified by the decision maker.

The third step focuses on identifying the relevant sales-effectiveness criteria for the sales organization and are represented by E_i ($i=1, \dots, N$), where N is the number of criteria identified. Since these criteria could be conflicting, weights (w_i) can be assigned to reflect their relative importance. (If the criteria are equally important, this can also be incorporated by setting $w_i=1$ for all i .) The specific goals (i.e., target levels) for each of these sales-effectiveness criteria are reflected by T_i . Further, since it may not be possible to concurrently achieve the targets for each criterion, deviational variables are introduced. These reflect the under- and over-achievement of the sales-effectiveness criteria from their specified target levels and are represented by U_i^- and O_i^+ , respectively.

At the fourth step, a reference set of sales organizations needs to be identified. This set should consist of organizations that (1) are engaged in selling the same product or service as the firm using this procedure since this facilitates comparability among the organizations, and (2) are relatively high performers within the same industry. (This is crucial since the fit between the structural and situational factors in this set are important elements in identifying the appropriate structural form for the sales organization under consideration.)

In identifying the reference set, both these aspects are important since one of the major thrusts of the proposed approach for sales-organization design is to specify an appropriate structure that is empirically based. An implicit assumption that draws on contingency arguments is that the observed structural form of the organizations in the reference set fits the situation within which these organizations operate, which in turn results in the organizations being high performers.

The fifth step focuses on empirically estimating the fits between the structural dimensions and the situational characteristics as well as their impact on the effectiveness criteria. Data collected from the reference set of sales organizations should be used to derive the fits. The procedure consists of regressing the relevant structural and situational factors and the interaction of pairs of these factors on each of the sales-effectiveness criteria [11].¹ Essentially, the parameters for N regression equations (i.e., one for each effectiveness criterion) need to be estimated.

Once the relationships between the structural dimensions and the situational characteristics and their impact on the multiple-effectiveness criteria have been estimated, the sixth step focuses on the specification of the goal programming model. The primary thrust of the model is to determine how a specific sales organization should be characterized in terms of its relevant structural dimensions. In doing so, the model attempts to simultaneously achieve prespecified target levels (T_i) for each of the sales-effectiveness criteria. However, since conflicts between the criteria are likely to occur, weights (w_i) that reflect the relative importance of the sales-effectiveness criteria (i.e., the greater the weight assigned, the more important the criterion) need to be assigned by the decision maker (the greater the

¹ Although a major criticism of this procedure is that the presence of multicollinearity could result in unstable coefficient estimates, procedures for minimizing this could be used [8].

weight, the more important is the criterion). Further, the inability to simultaneously achieve target levels for all the effectiveness criteria necessitates the introduction of deviational variables. Hence, using traditional goal programming techniques, the primary linear objective minimizes the under- and over-achievement (U_i^- and O_i^+ ; respectively) of all sales-effectiveness criteria from their prespecified target levels and is formulated as follows:

$$\text{Minimize } Z = \sum_{i=1}^N w_i(O_i^+ + U_i^-). \quad (1)$$

This objective is achieved by considering several restrictions. First, the relationship between the structural dimensions and the situational factors and their impact on each of the sales-effectiveness criteria are incorporated. As noted in the fifth step of the proposed approach, these are empirically derived by regressing the structural variables S_j ($j=1, \dots, M$), the situational variables C_k ($k=1, \dots, K$), and interactions between pairs of these variables on each effectiveness criterion E_i using data collected for the reference set of sales organizations. Thus, the first constraint set consists of the N nonlinear equations for which the parameters are estimated using regression analysis. The constraints in this set are as follows:

$$E_i = \alpha_i + \sum_{j=1}^M (\theta_{ij} S_j) + \sum_{k=1}^K (\tau_{ik} C_k) + \sum_{(j,k) \in F_i} (\mu_{ijk} S_j C_k) \quad \text{for all } i, \quad (2)$$

where

$\alpha_i, \theta_{ij}, \tau_{ik}, \mu_{ijk}$ = estimated regression parameters; and
 F_i = set of structural and situational factor pairs (j,k) that impacts effectiveness criterion i .

(Although equation set (2) is currently formulated so that the structural and situational factors are linearly related to effectiveness, it could be modified to incorporate nonlinear factors.)

Second, the specific situational conditions under which the sales organization operates are included. This is incorporated in a set of K linear constraints, one for each situational characteristic. Each of these constraints describe the situational conditions facing the sales organization. Note that the values of v_k for each situational characteristic k are required to be input by the decision maker. These constraints are as follows.

$$C_k = v_k \quad \text{for all } k. \quad (3)$$

Finally, since potential conflicts between the sales-effectiveness criteria can exist, it may not be possible to simultaneously achieve the target levels. This aspect is included in a set of N linear constraints, one for each effectiveness criteria. Each of these constraints allows for over- or under-achievement of an effectiveness criterion from its prespecified target level. The target levels T_i for each effectiveness criterion i are needed as inputs to the model. These N constraints are as follows:

$$E_i - O_i^+ + U_i^- = T_i \quad \text{for all } i. \quad (4)$$

In sum, the complete nonlinear goal programming model for sales-organization design includes the objective function (1) with the constraint sets (2), (3), and (4). However, several issues need to be clarified before implementing the model.

1. Before the model can be used, several inputs are required from the decision maker. These are the target levels (T_i) and the weights (w_i) for the N sales-effectiveness criteria as well as the values (v_k) for the K situational characteristics. Further, the parameters θ_{ij} , τ_{ik} , and μ_{ijk} in constraint set (2) need to be empirically derived using regression analysis.
2. Once the v_k values are input by the decision maker, the model collapses to a linear goal programming model since the K situational factors are fixed at these values.
3. To avoid scale effects based on the operationalizations of variables, the model should be specified using standardized values.
4. In addition to identifying the values for the structural dimensions (i.e., S_j), a solution to the model will also indicate whether each sales-effectiveness criterion has met the prespecified target level (i.e., values of U_i^- or O_i^+ will also be determined in a particular solution to the model).

The seventh and final step of the proposed approach focuses on model implementation. At this point, the decision maker can examine the effect of changes in several conditions and their impact on the structural design for a sales organization. This is discussed in the three scenarios presented below.

The first scenario examines the changes in the specified structural dimensions that are required due to anticipated changes in situational characteristics. For example, if the level of competitive activity is expected to increase significantly, it would be useful to identify the necessary structural changes to ensure that the goals are achieved. Thus, given a fixed set of target levels and weights for the sales-effectiveness criteria, the corresponding changes required in the structural dimensions can be generated by changing the v_k values in constraint set (3).

A second scenario that could arise is if the relative importance of the sales-effectiveness criteria changes. For example, if the sales organization shifts its emphasis from sales growth to enhancing sales efficiency, the necessary modifications to the structural dimensions that ensure these objectives are met need to be identified. Thus, given a fixed set of target levels and situational characteristics, by modifying the weights (w_i) in the objective function (i.e., equation (1)), the impact on the structural dimensions can be assessed. Similarly, if the specific target levels required revision due to uncertain conditions, the impact of such changes on the structural dimensions can also be estimated. This is accomplished by changing the values of T_i in constraint set (4) given that the weights for the sales-effectiveness criteria and values for the situational characteristics are fixed.

The third scenario focuses on incorporating restrictions on a subset of the M structural dimensions. Due to organizational inertia or resource constraints, it is likely that some of the structural dimensions are only adjustable within restricted bounds (e.g., due to budgetary concerns, between two and four sales divisions must be maintained). In such circumstances, the model presented above needs to be modified to incorporate maximum and minimum levels for these restricted structural dimensions. However, it is likely that target levels on certain sales-effectiveness criteria (e.g., sales efficiency) can only be accomplished by ensuring flexibility in modifying the restricted structural dimensions (e.g., increasing or decreasing the number of sales divisions). In other words, there is a trade-off between the costs of maintaining these bounds on the restricted structural dimensions

versus the benefits of meeting target levels on the sales-effectiveness criteria. In such conditions, it is difficult to achieve simultaneously the target levels for the effectiveness criteria while maintaining the maximum and minimum bounds on the restricted structural dimensions. Hence, the over- and under-achievement of these restricted structural dimensions from prespecified levels need to be considered. Therefore, the following constraint sets need to be added to the original formulation:

$$S_j - O1_j^+ \leq B_j \quad \text{for } j \in Q \quad (5)$$

$$S_j + U1_j^- \geq A_j \quad \text{for } j \in Q \quad (6)$$

where

B_j, A_j = upper and lower bound (maximum and minimum levels, respectively) on restricted structural variable j ,

Q = set of restricted structural variables, and

$O1_j^+, U1_j^-$ = over-/under-achievement of structural variable j .

Further, weights need to be assigned to the restricted structural variables along with the weights previously assigned to the sales-effectiveness criteria. (Since the approach meets the target levels in decreasing order of the weights, $w1_j$ should be substantially greater than weights w_j if the restricted structural dimensions are relatively more important than the sales-effectiveness criteria and vice versa.) Hence, the objective function in the original model (1) is replaced by (7) as follows:

$$\text{Minimize } Z = \sum_{i=1}^N w_i(O_i^+ + U_i^-) + \sum_{j \in Q} w1_j(O1_j^+ + U1_j^-) \quad (7)$$

where

$w1_j$ = priority assigned to over-/under-achievement of structural variable j .

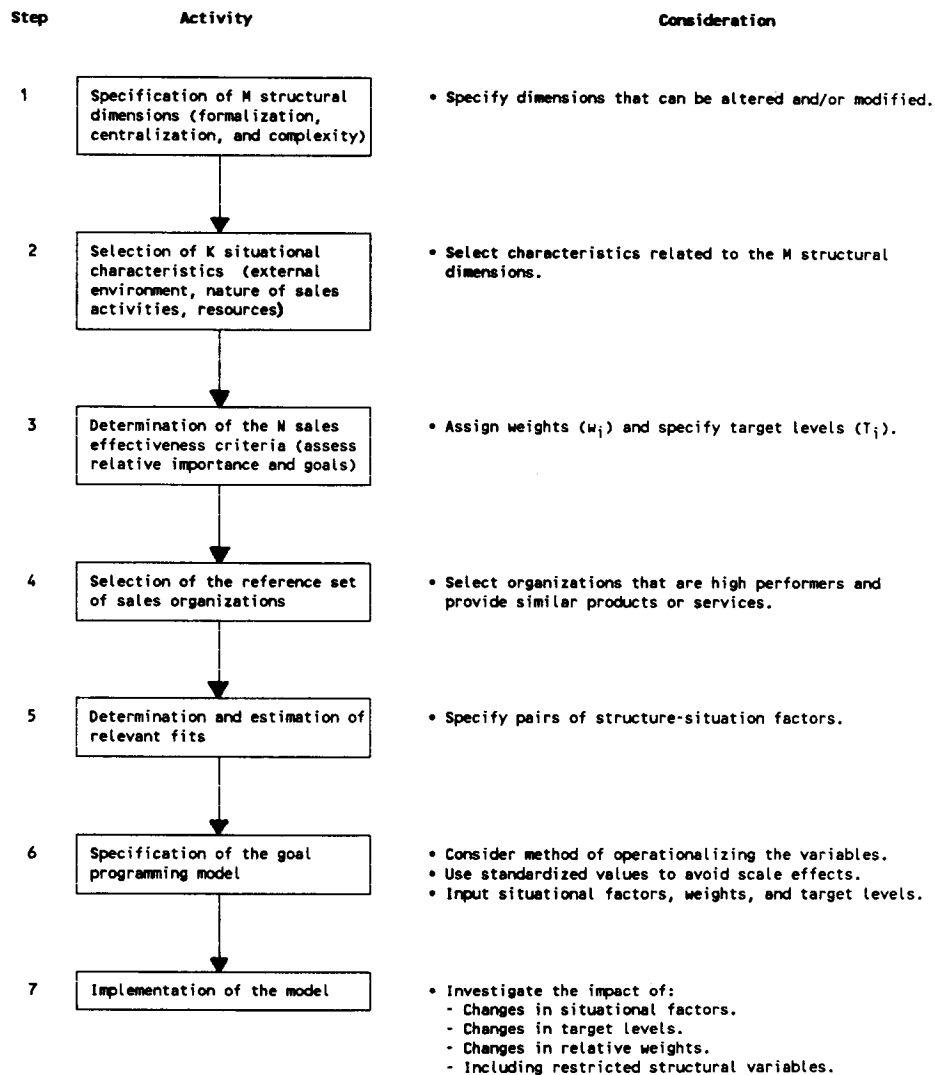
The three scenarios presented above allow the decision maker to carry out a “what-if” analysis before finalizing the structural design of the sales organization. An overview of the approach discussed in this section is presented in Figure 1. In the next section, we present an empirical application of the proposed approach for a specific sales organization.

AN EMPIRICAL APPLICATION

To describe the empirical application, each step of the approach for sales-organization design is described in detail below. The problem was examined in the context of the brokerage industry since the sales function is critical in the marketing of financial services [27]. Specifically, sales organizations were operationalized as retail branches of distinct brokerage firms. Hence, the user organization is assumed to be a sales branch of a specific brokerage firm.

The first, second, and third steps of the approach focus on identifying the set of structural dimensions, situational characteristics, and the sales-effectiveness criteria (respectively) for brokerage branches. Four of the six structural dimensions discussed earlier were selected for this application. The primary criterion used in selecting the dimensions was whether they could be modified to fit the situational

Figure 1: An overview of the multiobjective approach to sales-organization design.



conditions. These included formalization (S_1), centralization (S_2), vertical complexity (S_3), and personal complexity (S_4). Because the unit of analysis consisted of sales branches, horizontal complexity was not deemed relevant. Similarly, spatial complexity was not considered because territory coverage for each branch was typically determined at higher levels within the firm.

Of the five situational characteristics (i.e., environmental complexity, environmental dynamism, nonroutineness, interdependence, and size), three were considered to be critical to the effective functioning of the brokerage branches. These three were environmental dynamism (C_1), interdependence of sales activities (C_2), and size (C_3). Since retail branches within a single state were used as the unit of analysis, environmental complexity was excluded since the types of customers and competitors were fairly similar across different branches. This was also confirmed in personal interviews with the industry experts and branch managers. Similarly,

nonroutineness was also of less concern in these branches since there was little or no variation in the types of products and services handled by the different branches.

Three specific sales-effectiveness criteria were selected based on in-depth interviews with experts in the brokerage industry (eight branch managers who occupied the highest positions and were completely responsible for all the operations of a particular brokerage retail outlet). These criteria were sales efficiency (E_1), sales growth (E_2), and average sales (E_3). Further, these criteria are likely to be conflicting; in order to increase sales efficiency (defined as the ratio of total sales to total commissions), it is necessary to lower expenses while to enhance average sales or growth in sales, higher expenses are incurred.²

The fourth step of the approach focuses on identifying the reference set of sales organizations that will be used to identify the fits between the relevant structural dimensions and the situational characteristics. To ensure consistency in the products and services provided, branches were selected from a single state using the Standard and Poor's Directory of Security Dealers of North America.³ Since limited information was available on performance criteria for branch operations, the number of salespeople employed and the number of years in operation were used as surrogate measures. The underlying assumption was that if a branch was in existence for a longer period of time (i.e., at least two years) and was of sufficient size (i.e., employed at least five salespeople), the sales organization was considered to be a relatively better performer. Hence, the reference set consisted of branches from 47 distinct organizations from which key informant (i.e., a branch manager) reports were collected on the relevant structural, situational, and effectiveness factors. (In terms of response rates, these 47 branches represented a 42 percent response rate, which was considered adequate given that the data were collected using a mail survey.) Exhibit 1 shows a listing and operationalization for each variable used in this application.

The data collected on the reference set of sales organizations were used to estimate the fit between the structural and situational factors at the fifth step. However, before estimating this fit, it was necessary to specify which situational and structural factors interacted. In this application, out of twelve possible fits (i.e., since four structural and three situational factors were identified), the following were regarded as critical for effective functioning of these branches.

1. Environmental dynamism is important for vertical complexity since the uncertainty in the environment is likely to impact the amount of supervision necessary as reflected in the number of levels in the organization hierarchy (S_3C_1).
2. Interdependence is relevant for formalization since the rules and regulations pertaining to the sales activities are likely to impact the extent to which employees work together to effectively provide the service (S_1C_2).
3. Interdependence is also related to personal complexity because different levels of specialization among employees (S_4C_2) are required, whether the sales activities are performed jointly or individually.
4. Finally, the size of the branch has a bearing on centralization because the likelihood of effective decision making depends on the number of employees participating in the process (S_2C_3).

²An examination of the correlations between these criteria revealed negative relationships, suggesting some conflict between them.

³Branches from a single state (Wisconsin) were selected to control for differences in operating procedures due to different state laws governing financial institutions. Note that the user branch would not be considered as part of the reference set in deriving the fits.

Exhibit 1: Operationalization of variables.

	Operationalization
<i>Structural Dimensions</i>	
Formalization (S_1)	A 12-item scale assessing the extent to which written rules and documents exist for general and specific aspects of the job.
Centralization (S_2)	A seven-item scale measuring the degree of participation in decision making.
Vertical complexity (S_3)	The number of management levels in the unit.
Personal complexity (S_4)	The number of occupational specialties that represent distinctive types of knowledge and training.
<i>Situational Characteristics</i>	
Environmental dynamism (C_1)	A five-item scale measuring the extent of change in sales potential, investment preferences, and competitive activities.
Interdependence (C_2)	A three-item scale measuring the extent a salesperson collaborates with others.
Size (C_3)	The total number of full- and part-time sales personnel employed.
<i>Effectiveness Criteria</i>	
Sales efficiency (E_1)	The ratio of total yearly expenses to total yearly commissions.
Sales growth (E_2)	The percentage change in total commissions generated over a year.
Average sales (E_3)	The level of production of commission dollars for a typical broker.

These hypothesized interactions were used to regress the selected structural, situational, and fit (i.e., interaction terms) variables on each of the three sales-effectiveness criteria. (In these regressions, efforts were made to reduce multicollinearity by using deviations from the means instead of the raw scores [8]. As a result, there was little evidence of multicollinearity, as verified by the correlation matrix of the independent variables.) The independent variables explained 50.1 percent of the variation in sales efficiency ($F=5.367$, $p \leq .00$), 21.5 percent of the variation in sales growth ($F=2.146$, $p \leq .04$), and 19.5 percent of the variation in average sales ($F=2.015$, $p \leq .05$).

Based on this estimation of the fit equations, the sixth step of the approach focuses on specifying the goal programming model for sales-organization design for the branch using the approach. A specification of this model for the user branch is shown in Exhibit 2. The objective function minimizes the over- and under-achievement of the three sales-effectiveness criteria (i.e., O_i^+ and U_i^-). Since it is likely that conflicts between these criteria exist, weights (i.e., w_i) are assigned to each criterion. The first three equations in constraint set (1) include the estimated parameters from the regressions and reflect the impact of the structural dimensions, situational characteristics, and the fits on the sales-effectiveness criteria.⁴ In addition, inequalities that confine the structural variables to values consistent with the sample data are also included (see constraints (d) through (g) in constraint set (1)). Constraint set (2) consists of equations reflecting specific values for the situational variables (i.e., v_k). Finally, the equations in constraint set (3) attempt to achieve the target levels for the effectiveness criteria (i.e., T_j).

The model in Exhibit 2 is used in the final step of the proposed approach, which focuses on model implementation. At this point, three scenarios outlined in the previous section can be examined for the user branch. Essentially, these scenarios can be used by the branch sales manager to carry out a what-if analysis

⁴While constraint set (1) in Exhibit 2 contains the unstandardized coefficients from the regressions, standardized coefficients were used to generate the findings in order to avoid scale effects.

Exhibit 2: Specification of the goal programming sales-organization model.**Objective Function**

$$\text{Minimize } Z = w_1(O_1^+ + U_1^-) + w_2(O_2^+ + U_2^-) + w_3(O_3^+ + U_3^-)$$

Constraint Set (1):

- (a) $E_1 + .184S_1 - .331S_2 - 11.504S_3 - .166S_4 - .688C_1 + .138C_2 - .129C_3 + .315S_1C_2 - .241S_2C_3 + 2.541S_3C_1 - 1.671S_4C_2 = 24.249,$
- (b) $E_2 + 1.127S_1 - 2.094S_2 + 7.424S_3 + 2.478S_4 + .406C_1 + 1.549C_2 + .046C_3 - .935S_1C_2 - .044S_2C_3 + 1.366S_3C_1 + 1.755S_4C_2 = 144.741,$
- (c) $E_3 + 2.610S_1 - 6.193S_2 + 102.962S_3 + 34.130S_4 - 28.457C_1 + 36.548C_2 - .031C_3 + 2.590S_1C_2 - .961S_2C_3 - 6.173S_3C_1 - 7.265S_4C_2 = 490.953,$
- (d) $14 \leq S_1 \leq 54,$
- (e) $7 \leq S_2 \leq 29,$
- (f) $1 \leq S_3 \leq 4,$
- (g) $0 \leq S_4 \leq 6.$

Constraint Set (2):

- (a) $C_1 = v_1,$
- (b) $C_2 = v_2,$
- (c) $C_3 = v_3.$

Constraint Set (3):

- (a) $E_1 - O_1^+ + U_1^- = T_1,$
- (b) $E_2 - O_2^+ + U_2^- = T_2,$
- (c) $E_3 - O_3^+ + U_3^- = T_3.$

before finalizing an organization design. Thus, the findings presented below focus on each of these scenarios.

Upon examining the effects of these changes, we classified the preliminary values for the situational factors and the resulting values for the structural dimensions into three categories of high, medium, and low to facilitate interpretation. These categories were based on the distributional properties of each dimension. Specifically, a particular situational or structural dimension was classified as low if its value was less than one standard deviation below the mean. It was considered to be high if its value was greater than one standard deviation above the mean; it was categorized as medium otherwise (see Note 1 to Tables 1, 2, and 3). Further, if the goals on the sales-effectiveness criteria are achieved, a "Yes" is indicated (see Note 2 to Tables 1, 2, and 3). The XMP mathematical programming library [20] was used to derive the solutions presented below.

Impact of Changing Situational Conditions

In order to examine the changes in the structural dimensions due to changes in the situational characteristics, we assumed that the sales-effectiveness criteria for the user branch were of equal importance (i.e., $w_i = 1$ for all i). Further, since most branches would attempt to enhance sales growth and average sales while reducing expenses to commissions (sales efficiency), the target levels to be achieved were set at high levels (i.e., one standard deviation above the mean for sales growth and average sales and one standard deviation below the mean for sales efficiency; see Note 3 to Table 1). The impact of changing situational characteristics on the sales-effectiveness criteria and the structural dimensions is displayed in Table 1. The findings show that as the situational characteristics change from low to high conditions, the structural dimensions are impacted as follows.

Table 1: Impact of changing situational characteristics.

Situational Characteristics	Effectiveness Criteria			Structural Dimensions			
	EFF	GRO	AVSL	FORM	CENT	V.C.	P.C.
Low	Yes	Yes	No (155)	Low	High	Low	Medium
Medium	No (47)	Yes	Yes	Medium	High	Low	Low
High	Yes	Yes	Yes	Medium	Medium	Medium	Medium

Notes:

- The values for the situational characteristics are as follows:

	DYN (C_1)	INT (C_2)	SIZE (C_3)
Low	6.5	4.1	5
Medium	13	6.5	11
High	19.5	8.9	17

The structural dimensions are categorized as follows:

	FORM	CENT	V.C.	P.C.
Low	<16.8	<9.2	<1.7	<.1
Medium	16.8-29.6	9.2-19.2	1.7-3.1	.1-4.2
High	>29.6	>19.2	>3.1	>4.2

- For the effectiveness criteria, the following holds true:

Yes \equiv Target level is achieved,

No (x) \equiv Target level is not achieved, but the value of x is achieved.

- The values for the weights and target levels are as follows:

$$w = w_2 = w_3 = 1$$

$$T_1 = 31.64, T_2 = 153.60, T_3 = 175.23.$$

First, formalization increases and centralization decreases. Hence, more rules and procedures and greater participation (as reflected by higher formalization and lower centralization) provide the branch more direction in dealing with the uncertainty stemming from changes in the situational conditions. Second, vertical complexity increases. Thus, an increase in environmental dynamism, interdependence, and size, together with greater supervision (as reflected by increased vertical complexity), enables the branch and its employees to better coordinate their activities in dealing with changes. Third, there is no discernible effect on personal complexity. A potential interpretation for this is that some degree of specialization is inherent for the effective functioning of brokerage branches; hence, personal complexity does not change with situational conditions.

Overall, the findings show that the target levels for each of the effectiveness criteria were achieved in most cases. This suggests that the structural dimensions can be adapted to changes in the situational conditions to achieve desired target values for the effectiveness criteria.

Impact of Changing Relative Weights and Target Levels

The second scenario focuses on how the structure should be characterized when the sales-effectiveness criteria are weighted in order of importance or when different goals relating to these criteria have to be met. First, in order to examine the impact of prioritizing different sales-effectiveness criteria, each sales-effectiveness criterion was weighted in turn by assigning a substantially higher weight as compared to the weight assigned to the other two criteria (i.e., the ratio of weights was 10¹¹:1:1 if E_1 was considered more important than E_2 or E_3 ; see

Table 2: Impact of changing relative weights and target levels.

	Effectiveness Criteria			Structural Dimensions			
	EFF	GRO	AVSL	FORM	CENT	V.C.	P.C.
a: Impact of Changes in Relative Weights							
<i>Weight Criteria</i>							
EFF	No (34)	No (73)	No (146)	High	Low	Low	Low
GRO	No (46)	Yes	No (171)	Low	High	Medium	Medium
AVSL	No (48)	No (164)	Yes	Low	High	Medium	High
b: Impact of Changes in Target Levels							
<i>Target Levels</i>							
Low	No (74)	Yes	No (151)	High	High	High	Medium
Medium	Yes	Yes	Yes	Medium	Medium	Medium	Medium
High	No (47)	Yes	Yes	Medium	High	Low	Low

Notes:

1. The structural dimensions are categorized as follows:

	FORM	CENT	V.C.	P.C.
Low	<16.8	<9.2	<1.7	<.1
Medium	16.8-29.6	9.2-19.2	1.7-3.1	.1-4.2
High	>29.6	>19.2	>3.1	>4.2

2. For the effectiveness criteria, the following holds true:

Yes \equiv Target level is achieved,No (x) \equiv Target level is not achieved, but the value of x is achieved.

3. The relative weights for panel a are as follows:

EFF: $w_1:w_2:w_3=10^{11}:1:1$ GRO: $w_1:w_2:w_3=1:10^{11}:1$ AVSL: $w_1:w_2:w_3=1:1:10^{11}$

The values for the situational characteristics and target levels for panel a are as follows:

 $C_1=13.00$, $C_2=6.50$, $C_3=11.00$, $T_1=31.64$, $T_2=153.60$, $T_3=175.23$.

4. The target levels for panel b are as follows:

	EFF (E_1)	GRO (E_2)	AVSL (E_3)
Low	78.82	83.38	118.58
Medium	58.30	107.19	135.22
High	31.64	153.60	175.23

The situational characteristics and weights for panel b are as follows:

 $C_1=13.00$, $C_2=6.50$, $C_3=11.00$, $w_1=w_2=w_3=1$.

Note 3 to Table 2).⁵ Further, to generate the solution, typical (i.e., medium) situational conditions and high target levels were assumed (see Note 4 to Table 2). The findings are summarized below (see Table 2a for details).

By weighting either sales growth or average sales (i.e., GRO or AVSL), it is possible for the user branch to achieve prespecified target levels for these criteria (see diagonal entries under effectiveness criteria of Table 2). However, in the case of sales efficiency (i.e., EFF), the target level was over-achieved by a small amount. This latter finding can be attributable to the specific situational condition

⁵A weight of 10^{11} was selected to ensure that the target level for the specific sales effectiveness criteria was achieved before the target level for any of the other criteria.

assumed and is consistent with the results discussed earlier, that is, the target levels for sales efficiency were achieved under low and high situational conditions but not under medium conditions (see Table 1). The only plausible explanation is that there is a "floor" for these situational conditions below which expenses cannot be reduced.

When a particular sales-effectiveness criterion is assigned a higher weight, the target levels on the remaining criteria are not achieved since conflicts between the criteria exist. For example, when the effectiveness criterion of average sales is emphasized, the target levels for both sales efficiency and sales growth are not achieved (see off-diagonal entries under effectiveness criteria in Table 2).

The results also suggest how structure should be characterized if a specific effectiveness criterion is to be achieved (see entries under structural dimensions in Table 2). For example, if sales growth or average sales are emphasized, higher levels of centralization, vertical complexity, and personal complexity and lower levels of formalization are required. This is plausible since greater direction (i.e., centralization), supervision (i.e., vertical complexity), specialization (i.e., personal complexity), along with some degree of flexibility (i.e., lower formalization) facilitate sales growth and average sales.

In order to examine the effects of varying the target levels, three target levels were determined as follows. Low levels were computed as one standard deviation above the mean for sales efficiency and one standard deviation below the mean for sales growth and average sales. Further, the converse procedure was used to determine the high levels, while the medium levels consisted of the mean values for the three effectiveness criteria (see Note 4 to Table 2). Additionally, the sales-effectiveness criteria were assumed to be equally important and typical situational conditions were presumed to exist. The results can be summarized as follows (see Table 2 for details).

For sales growth and average sales, target levels were achieved in most cases; for sales efficiency, only one of the target levels was achieved (see entries under effectiveness criteria in Table 2). Further, when target levels were high, formalization, vertical complexity, and personal complexity were lower while centralization was the same compared to when target levels were low (see entries under structural dimensions in Table 2). In other words, as the branch revises its goals upward, rules and procedures, supervision, or specialization hamper goal attainment. Finally, the primary difference between emphasizing a particular sales-effectiveness criteria (i.e., Table 2) and requiring high performance on all criteria (i.e., Table 2) is that greater supervision and specialization are necessary in the former case; in the latter case, branches that perform well are typified by employees operating autonomously and functioning as generalists [27].

Impact of Including Restricted Structural Dimensions

The third scenario relates to how the sales-organization design changes if a number of the structural dimensions are restricted due to organizational inertia or resource constraints in the user branch. Since vertical and personal complexity are most likely to be affected by factors such as resource constraints, upper and lower bounds were placed on these two dimensions. Further, variables reflecting over- or under-achievement of these bounds are also introduced (i.e., $O1_j$ and $U1_j$) and weights (i.e., $w1_j$) on the restricted structural dimensions are included in the objective function (see Note 3 to Table 3). By including these variables, trade-offs between achieving the bounds for the restricted structural dimensions and

Table 3: Impact of including restricted structural dimensions.

Restricted Structural Dimensions	Effectiveness Criteria			Structural Dimensions			
	EFF	GRO	AVSL	FORM	CENT	V.C.	P.C.
Prioritize Effectiveness Criteria	Yes	Yes	Yes	Low	High	No (Low)	Yes (Medium)
Prioritize Structural Dimensions	No (60)	No (152)	No (155)	Low	High	Yes (Medium)	Yes (Medium)

Notes:

1. The structural dimensions are categorized as follows:

	FORM	CENT	V.C.	P.C.
Low	<16.8	<9.2	<1.7	<.1
Medium	16.8-29.6	9.2-19.2	1.7-3.1	.1-4.2
High	>29.6	>19.2	>3.1	>4.2

2. For the effectiveness criteria and the restricted structural dimensions the following holds:

Yes (x) \equiv Target level/bound is achieved at level x .

No (y) \equiv Target level/bound is not achieved, but the value/level of y is achieved.

3. In both the "prioritize" solutions, the "restricted" structural dimensions (i.e., vertical and personal complexity) are included and the following constraints are incorporated:

$$S_3 + O1_3^+ \geq 2$$

$$S_3 - U1_3^- \leq 3$$

$$S_4 + O1_4^+ \geq 2$$

$$S_4 - U1_4^- \leq 4.$$

The objective function for the solutions is reformulated as follows:

$$\text{Minimize } Z = w_1(O_1^+ + U_1^-) + w_2(O_2^+ + U_2^-) + w_3(O_3^+ + U_3^-) + w1_3(O1_3^+ + U1_3^-) + w1_4(O1_4^+ + U1_4^-).$$

The weights used for each solution are as follows:

$$\text{"Prioritize-Effectiveness": } w_1 = w_2 = w_3 = 10^{11} \text{ and } w1_3 = w1_4 = 1$$

$$\text{"Prioritize-Structure": } w_1 = w_2 = w_3 = 1 \text{ and } w1_3 = w1_4 = 10^{11}.$$

4. The situational characteristics and target levels are as follows:

$$C_1 = 13.00, C_2 = 6.50, C_3 = 11.00,$$

$$T_1 = 31.64, T_2 = 153.60, T_3 = 175.23.$$

achieving the target levels of the effectiveness criteria can be investigated. These trade-offs were examined by weighing the effectiveness criteria over the restricted structural dimensions and vice versa (see Note 3 to Table 3). As earlier, typical situational conditions and high target levels were assumed (see Note 4 to Table 3).

Table 3 shows the results when the restricted structural dimensions are included and the effectiveness criteria are emphasized over these dimensions and vice versa. When the sales-effectiveness criteria were emphasized over the restricted structural variables, the target levels for all three criteria were achieved (see first row of Table 3). However, this was possible only if the lower bound on vertical complexity was violated. This indicates the trade-off between the effectiveness target levels and maintaining the restrictions on the structural dimensions. On the other hand, when the restricted structural dimensions of vertical and personal complexity were emphasized, the bounds on these variables were observed but none of the target levels for the effectiveness criteria were achieved (see second row of Table 3).

In sum, this empirical application for a user branch has highlighted several findings relevant for sales-organization design. First, certain levels of the structural dimensions are more appropriate depending on the situational conditions. However, regardless of the situational conditions, specific effectiveness goals can be achieved by identifying the appropriate levels for each structural dimensions. Second, the appropriate levels for the structural dimensions also depend on which sales-effectiveness criterion is of importance or what goals are to be achieved. Further, emphasizing a particular effectiveness criterion leads to a structural design that enables the achievement of goals for that criterion, but this is usually at the cost of being unable to achieve the goals for the other criteria. Finally, restrictions on some of the structural dimensions could result in trade-offs between maintaining these restrictions or achieving specific goals on the sales-effectiveness criteria. Hence, if these restrictions are enforced, the goals on the effectiveness criteria are unlikely to be achieved. If the target levels on the effectiveness criteria are emphasized, the structural restrictions could be violated.

IMPLICATIONS AND CONCLUSIONS

The primary thrust of this paper was on a question of fundamental concern to marketing decision makers: what is the appropriate structural design for the sales organization? Despite the importance of this issue, there has been little research that directly addresses this question. In this paper, we presented an approach that can be used to specify such a structural design. This approach incorporates existing contingency perspectives on sales-organizational design, the situational characteristics under which the organization operates, and multiple and conflicting effectiveness criteria in specifying a structural configuration for a sales organization. Further, since the significance of these criteria is likely to be different over time and across regions, weights reflecting their relative importance can also be included.

In addition to the theoretical underpinnings of the proposed approach, three unique features that enhance its flexibility and applicability are as follows. First, the approach is flexible enough to consider only a subset of structural factors and fits relevant in a particular setting. Second, the inclusion of situational factors as inputs enhances general applicability of the approach. Hence, the approach can be used in a variety of settings by organizations operating in different environments. Third, another facet that contributes to the applicability of the approach is the empirical component (i.e., the functional form of the fits between the structural and situational factors is empirically determined). Although the forms of the fits could have been prespecified and incorporated in the underlying model with relative ease, this was considered undesirable as they are likely to vary from setting to setting (and on the sales-effectiveness criteria under consideration).

There are several decision-making implications of this research. One of the most important is that it provides preliminary guidelines on how the internal form of the sales organization should be characterized. Thus, the proposed approach enables a sales manager to identify the appropriate structural characteristics given certain situational conditions and to identify potential structural modifications that are necessary when the situation is expected to change. Further, the approach provides an insight into the structural arrangement that facilitates achievement of specific effectiveness goals and whether the goals need to be revised. In addition, since situational conditions are a critical part of the approach, it requires managers

to recognize the context in which the sales organization is operating and how it affects effective functioning.

In conclusion, through an empirical application for a user branch, this paper also demonstrated that the approach provides internally consistent results. However, there are certain limitations of the approach which focus on its development, implementation, and interpretation. The first concern stems from the development stage in which the user is required to identify factors relevant in a specific setting. This feature is double-edged; although it increases the difficulty of using the approach, it results in greater applicability. The second concern stems from its empirical component as it necessitates data as input. While acquiring the data may be arduous, this acquisition of data facilitates the incorporation of industry-specific effects and enhances the realism of the approach. Finally, since some of the internal design dimensions are behavioral, caution needs to be exercised while interpreting the findings. Thus, a trade-off needs to be made between the problems associated with the interpretation of results and the benefits of enhancing the richness of the proposed approach. [Received: September 20, 1988. Accepted: June 9, 1989.]

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