A TYPOLOGY OF ADAPTIVE ORGANIZATIONAL CHANGES

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ABSTRACT

Three types of changes are proposed as being generic to an organization's adaptation to its environment. They are: (a) Change in pattern, (b) Change in Structure, and (c) Change of elements. The typology is based on Atkin's [4] mathematical structure. The typology attempts to characterize change on the basis of what is changed and what is held constant, instead of on the basis of the effects of the change as is done in a number of current typologies. The three types of changes are described and discussed with reference to a problem faced by a diverse and fragmented academic department. The typology provides a framework for a strategist to delineate alternative ways in which an organization can be changed to adapt to its environment, to evaluate the pros and cons of each alternative, and to make a choice.

INTRODUCTION

One purpose of strategic management is to change the organization to adapt to current and anticipated environmental threats and opportunities, and thereby to move the organization from the current state to the desired state. There are innumerable changes that can be made within a complex system such as an organization to adapt it to a dynamic environment. Each change, in effect, is a alternative available to the strategist. However, the alternatives are too many for the strategist to consider the pros and cons individually and make a choice. A systematic classification of changes is needed. A typology of adaptive organizational changes will facilitate

strategic decision making.

Three commonly used dichotomous typologies of change are based on effects of the change, not the change itself. One typology classifies changes as strategic and operational [1]. A change is deemed to be strategic if it helps the organization adapt to its environment, and to be operational if it has no impact on adaptation. Another typology classifies changes as effective and efficient [1]. A change which affects the organization-environment relationship is considered to be a change in effectiveness, and a change which affects only the internal structure and operations a change in efficiency. A third typology classifies changes as revolutionary and evolutionary [2]. A change is considered to be revolutionary (incorrectly, see [3]) if its effects are quick, dramatic, and wide ranging; whereas if the effects are slow, undramatic, and narrow in scope the change is considered to be evolutionary.

Classifying an organizational change based on the effects of the change, instead of on the change itself, as in the three typologies described above, is misleading, because the relationship between a change and its effects in an organization is not certain. In a complex system such as an organization, because of multifinality and equifinality, identical changes may have different effects, and similar effects may result from dissimilar changes. In classifying a change the focus should be on the root cause of the effects, not the effects themselves. It may sound tautological, but it has to be emphasized that a

change should be classified on the basis of what is changed, and what is not changed (i.e., constant); not on the basis of effects the change has.

Any characterization of change should simultaneously specify what is constant and what is changed. What is constant is the context in which the change occurs, and is as important as the change itself. If the context is not specified, discussion of any change is meaningless, just as it is meaningless to discuss the trajectory of a projectile without a constant spatio-temporal coordinate axes. In Atkin's [4] terminology, change can be meaningfully discussed only in the background of a static back cloth. [See Note 1.]

A Typology of Organizational Change

To describe what is constant and what has changed a map of the system is needed. The map should specify: (a) the elements of the system, (b) the structure of relationships between the elements, and (c) patterns defined on the elements of the system.

A map specifying the above provides a static back cloth --the coordinate axes--within which to characterize a systemic change. In the framework of the map three basic types of changes are possible. They are:

(a) Change in pattern,

(b) Change in structure, and

(c) Change in the set of elements.

Suppose we consider the organization as a large matrix of

relationships between a number of elements. A change in the value of elements is change in pattern. A change in relationships between elements is a change in structure. A change in the set of elements is self explanatory.

A change in pattern is the simplest type of change. A change in the priority of objectives is a change in pattern. Similarly, a change in relative emphasis of print media as compared to TV, for advertisement and promotion, is a change in pattern. A change in pattern does not change the structure or elements; it is however constrained by the existing structure and elements. On the other hand, a change of pattern may result from change of structure, of the set of elements, or both.

A change in structure is more complex than a change in pattern. A change in structure may alter patterns, but will not affect the list of elements. Changes in structure may be of two types. First, an existing relation may be deleted, or a new relation may be added. Second, an existing relation may be modified. Establishing direct communication between sales and R&D, if there is none, is an example of the first type. Improving efficiency, which alters the input-output relationship, is an example of the second type.

A change in the set of elements is the most complex change. Such a change will alter the structure and pattern. A change in the set of elements redefines the boundary of the organization. Elements may be deleted from or added to the organization. Elimination of a product line is an example of

deleting an element. Obversely, addition of a new product line is an example of adding an element.

Following is a detailed illustration of the three types of change and the pros and cons of each type.

AN ILLUSTRATION

Structure of an Academic Department

Table 1 summarizes the structure of faculty research interests within a department of a midwestern university. There are fourteen faculty members and twenty two interests. The data were obtained from a brochure compiled by the department chairman to send to prospective candidates for faculty positions within the department. The data in the brochure were, in turn, based on individual statements of interests provided by the respective faculty members.

In listing the interests no attempt has been made to combine similar interests. The interests are labelled as given in the brochure. It is true some interests appear to be very similar, although labelled slightly differently. For example, operations management could conceivably be a subset of production and operations management. But such marginal differences in labelling interests may be accidental or deliberate; they may be simply due to differences in choice of words or due to a conscious attempt to differentiate ones interests from others'. Irrespective of reasons for the marginal differences, combining synonymous interests will change the set of elements,

which, in turn, will alter the structure and pattern. If the differences are accidental the resistance to such change will be minimal. On the other hand, if the differentiation is deliberate, resistance to change will be high.

Analysis of the Structure

It may be noted in Table 1 that the number of interests a faculty member has varies from one to six. Also, the number of faculty members having an interest ranges from one to five. A more descriptive summary of the structure is given in Tables 2, 3, 4, and 5.

Tables 2 and 3 summarize the valency and bond strength of each faculty element and interest element respectively. Valency is defined as the maximum number of linkages an element can have. For each faculty member, valency is equal to the number of interests (s)he has. The valency of a faculty member represents the maximum number of interests (s)he can have in common with another faculty member, and consequently the maximum strength of the relationship (as measured by number of links or common interests) (s)he can have with another faculty member. For each interest, valency is equal to the number of faculty members having the interest. The valency of an interest represents the maximum number of faculty members that can have the particular interest in conjunction with another common interest, and consequently the maximum strength of the relationship (as measured by the number of links or common faculty members) the interest can have with another interest.

Tables 4 and 5 summarize groups of faculty and interests formed on the basis of the strength of linkages between the respective elements. The groups are ordered by linkage strength, and the number of groups corresponding to each linkage strength is also listed in the table.

An element enters a group at linkage strength equal to its valency. If the bond strength of the element is less than its valency, until the linkage strength is reduced to the value of the bond strength, the element remains single. In other words, when the linkage strength is greater than the bond strength, but less than or equal to the valency, the element will form a group by itself. Thus, a single faculty group represents a faculty member who does not share at least as many interests as the corresponding linkage strength with another faculty member. Similarly, a single interest group represents an interest which is not had in conjunction with another common interest by at least as many faculty members as the corresponding linkage strength.

Elements within a multi-element group are linked directly or indirectly by links at least as strong as the linkage strength. Determining the strength of the direct link between a pair of elements is straightforward; whereas determining the maximum strength of the indirect links is not so straightforward. (See Figure 1.)

The strength of the direct link between a pair of elements is the extent of overlap (measured in number of elements)

between the elements. The strength of the direct link between a pair of faculty members is the number of interest shared by the two faculty members. Similarly, the strength of the direct link between a pair of interests is the number of faculty members having both interests. As shown in Figure 1, if faculty members A and B share four interests, the strength of the direct link between A and B is four. If A and B are interests, and four faculty members have both interests, then too the strength of the direct link between A and B is four.

The strength of an indirect link between a pair of elements is equal to the strength of the weakest link in the chain linking the two elements. Thus, if elements A and C are linked indirectly through B, A-B has a linkage strength four, and B-C a linkage strength three, the strength of the indirect link between A and C is three. (See Figure 1.)

And, continuing the above example, if A and C are directly linked with strength two, the overall strength of the linkage between A and C will still be three--the maximum of the strength of the direct linkage and of the indirect linkage. (See Figure 1).

Because of the above rationale used in grouping, all pairs of elements within a group may not be linked directly with links equal to the linkage strength. They may be linked indirectly by a chain of links whose strength is at least equal to the linkage strength.

The diversity and fragmentation of the faculty can be seen in Tables 2 to 5. Following is a detailed discussion.

Fragmentation and Diversity Within the Department

As summarized in Table 2 six out of four faculty members have more than three interests. The rest have two or less interests. Half the faculty members have either only one or no interest in common with another faculty member; three have two interests in common and four have three interests in common with another faculty member.

The diversity and fragmentation is also evident in Table 3. Of the twenty two interests thirteen are individual interests, not shared by any other faculty member. Two of the interests are not linked to any other interest, and twelve interests are weakly linked (by just one faculty member) to another interest. Thus, although there is a large variety of interests within the department, there are few shared or strongly interlinked interests.

Table 4 shows the grouping of the faculty based on data in Tables 1 and 2. Even at the lowest linkage strength of one, there are three single person groups, the isolates. At linkage strength of two there is one group of five, one dyad, and four single person groups. At linkage level three there is one group of four and two single person groups. At linkage strength four, five and six there are only single person groups. Thus, except for the group of four, namely: {J, I, F, L } there are only weak linkages between faculty.

Table 5 shows the grouping of interests based on data in Tables 1 and 3. At the lowest linkage strength of one there are two single interest groups, one dyad, and one large group containing the other interests. At linkage strength two eight interests form a group, in addition to a single interest group. At linkage strengths of three and above, except for one dyad at strengths three and four, there are only single interest groups.

Thus, although there is a large number of faculty members within the department with a variety of interests, the lack of overlapping faculty members and overlapping interests make the department fragmented.

The Problem

In the above context the department is faced with the problem of decreasing number of undergraduate majors enrolling in the department. A number of reasons have been attributed to the decreasing enrollment. First, because of the diversity of subjects taught by the department, the inability to identify the department with a professional career path, as in the case of the accounting department, the finance department, etc. Second, related to the first, the lack of meaningful specializations, related to job prospects, within the department. Third, and last, a perception of the department as the 'liberal arts', supportive department rather than as area for majoring.

The department has to develop a focus (or a few foci) and an identity to solve the above problem. There are three ways

the department can develop a focus and identity. They are:

(a) By changing the pattern of emphasis on the different interests by manipulating the pattern of resources allocated to different faculty.

(b) By altering the structure of relationships between faculty and interests. This can be achieved by encouraging faculty to develop new interests in common with other current faculty interests, and to give up uncommon interest.

(c) By altering the elements. This can be achieved by combining interests, adding interests, deleting interests, adding faculty, etc.

Following is a detailed discussion of each alternative and its pros and cons.

Changing the Pattern

One way of developing a focus and an identity for the department would be to emphasize its strongly linked interest and deemphasize its peripheral, i.e., weakly linked and isolated interests (Table 5). This would entail at the very least deemphasis of organizational communication, production and operations, statistics and management science. If an even tighter focus is desired, all interests except OB, OT, Policy, OD, Managerial Behavior, Personnel, Research methods, and Management Education should be deemphasized. The emphasis of a few interests and deemphasis of other interests could be achieved by altering the pattern of resource allocation to the

corresponding faculty.

In manipulating the pattern of interests, the elements and the structure of relationships between elements remain unchanged. But, subsequently, changes in structure and elements may be induced by the changes in pattern. Complete deemphasis of an interest may result in the elimination of that interest from the set of faculty interests. The changed pattern of emphasis may induce faculty to develop interests in emphasized areas and reduce interests in deemphasized areas, thus altering the structure of faculty interests.

Manipulation of the pattern is constrained by the existing structure and elements, and by the effects such manipulation may induce in the structure and pattern. If the current faculty in the interests to be emphasized cannot utilize the additional resources allocated to them, altering the pattern of resource allocation will be meaningless, unless appropriate new faculty members are recruited. Similarly, if a tenured faculty member is going to become redundant due to the change in pattern of resource allocation, the particular change will not be feasible.

Thus, changing the pattern is appropriate when the structural relationships and boundary definitions (as defined by the set of elements) are not severe constraints. But, even then the strategist should evaluate the long term effects that may be induced in the structure and boundary while making the choice.

Changing the Structure

Structural changes are of two types: (a) addition of a new relationship, and (b) deletion of an existing relationship. Structural changes may be made directly, instead of inducing them over a period of time by manipulating the pattern of resource allocation. Faculty members may be persuaded to develop interests that they do not presently have, or to give up interests they presently have. Even if persuasion is not effective, environmental changes, such as reduced enrollment for particular courses, may force the faculty members to develop new interests and give up current interests.

Structural changes will almost certainly induce immediate changes in patterns defined on the elements. There may be no immediate effect on the set of elements. But, in the long run structural changes could alter the set of elements, for example, by making some interests redundant.

Structural changes are more fundamental than changes in pattern. They are not constrainted by the existing patterns defined on the elements. But they are constrained by the existing set of elements. They are relatively more difficult to reverse than changes in pattern. They are also more difficult to implement compared to pattern changes.

In the case of the particular academic department, through structural changes it would be possible to develop more linkages between faculty and between interests. If the faculty develop new interests without giving up current interests,

fragmentation will be reduced without reducing diversity. On the other hand, should the faculty give up current interests to develop new interests, fragmentation will be reduced at the expense of diversity.

Changing the Set of Elements

Changing the set of elements is the most fundamental change which can be introduced. By changing the set of elements the boundary of the problem is redefined. Changing the set of elements will immediately induce changes in structure and patterns.

The set of elements can be changed in a number of ways to achieve the desired purpose. Existing elements may be combined, for example, operations management and production and operations management may be combined. Existing elements may be divided into two or more new elements. New elements may be introduced; for example, new interests overlapping with current interests may be introduced to act as links and to facilitate focusing and integration of the various interests groups. Similarly, new faculty members whose interests overlap current faculty groups may be introduced to facilitate integration and focusing. Last, existing elements may be deleted. If the deleted element has a large number of relationships with other elements, the effect of deletion on the structure and patterns will be large, otherwise the effect will be small.

Changing the set of elements is even less reversible than the change of structure. As a consequence, in choosing this

course of action the strategist should carefully consider the effects, both short term and long term, that will be induced in the structure and patterns.

CONCLUSION

The above discussion is based on a temporal cross section of an organization. The map of the system includes information on the elements, structure, and patterns at a point in term. It does not include information on the predictable variations in the elements, structure, and patterns over time. Ideally these too should be encoded in the map. And, in weighing the alternatives the impact on the predictable variations also needs to be considered.

If the predictable variations are not explicitly considered there is a danger of confusing natural changes--those which would have occurred anyway, with or without the intervention of the strategist--with changes introduced or induced by the strategist. For example, it would be sheer folly for a manager to presume that the increased productivity is due to the new management practices when, in fact, it is due to the predictable effect of the learning curve.

However, given our limited understanding of the natural predictable changes in organizations, consideration of the time dimension is easier suggested than practiced.

REFERENCES

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3 A. Ramaprasad, "Revolutionary Change and Strategi Management," Behavioral Science, 27, 387-392, 1982.

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Note 1

The discussion in this paper is based on Atkin's 4 mathematical structure. The terminology is changed and minor modifications made to suit the present discussion. Following is a list of terms used by Atkin and the equivalent terms used in this paper:

Top-q	Valency
Bottom-q	Bond strength
q-value	Linkage strength
Q_q-value	Number of groups
Components	Groups

TABLE 1

Structure of Faculty Interests

FACULTY	ORGCOM	OPMGT	DECSCI	MGLBEH	MIS	HLTHCR	POLICY	OT	OB	LDRBEH	MGTED	PERSNL	BUSSOC	ORGPSY	OD	MFDYN	MGTPRO	RESMETH	MGTSCI	STATS	PRODOP	SMLBUS
A	1																					
B		1	1	1	1	1																
C							1	1														
D							1	1														
E				1					1	1	1											
F								1	1			1	1		1							
G												1		1								
H							1															
I						1		1	1		1				1							
J				1					1						1	1	1	1				
K																			1	1		
L									1			1			1			1				
M																					1	
N							1															1

Legend

ORGCOM - Organizational Communication
OPMGT - Operations Management
DECSCI - Decision Sciences
MGLBEH - Managerial Behavior
POLICY - Business Policy
OT - Organizational Theory
OB - Organizational Behavior
LDRBEH - Leader Behavior
MGTED - Management Education
PERSNL - Personnel Management
BUSSOC - Business and Society
ORGPSY - Organizational Psychology
OD - Organizational Development
MFDYN - Male-Female Dynamics
MGTPRO - Management Processes
RESMETH - Research Methods
MGTSCI - Management Science
STATS - Statistics
PRODOP - Production and Operations Management
SMLBUS - Small Business Administration

TABLE 2

Faculty Valencies[1] and Bond Strengths[2]

Faculty	Valency	Bond Strength
J	6	3
I	5	3
F	5	3
B	5	1
E	4	2
L	4	3
G	2	1
D	2	2
C	2	2
N	2	1
K	2	0
H	1	1
A	1	0
N	1	0

[1]Valency is defined as the maximum linkages an element (in this case a faculty member) can have with another element. It is equal to the total number of interests a faculty member has.

[2]Bond strength is defined as the maximum number of linkages an element has with another element. It is equal to the maximum number of interests a faculty member has in common with at least one another faculty member.

TABLE 3

Interests Valencies[1] and Bond Strengths[2]

Interest	Valency	Bond Strength
Organizational Behavior	5	4
Organization Theory	4	2
Strategic Management	4	2
Organization Development	4	4
Managerial Behavior	3	2
Personnel	3	2
Health Care	2	1
Research Methods	2	2
Management Education	2	2
Management Information Systems1	1	1
Decision Sciences	1	1
Operations Management	1	1
Organizational Communication	2	0
Small Business Administration	1	1
Production Operations	1	0
Statistics	1	1
Management Science	1	1
Management Processes	1	1
Male-Female Dynamics	1	1
Organizational Psychology	1	1
Business and Society	1	1
Leader Behavior	1	1

[1]Valency is defined as the maximum linkages an element (in this case an interest) can have with another element. It is equal to the total number of faculty members having the particular interest.

[2]Bond strength is defined as the maximum number of linkages an element has with another element. It is equal to the maximum number of faculty members having the particular interest in conjunction with another common interest.

TABLE 4

Faculty Groups

Linkage[1] Strength	Number[2] of groups	Groups
6	1	{J}
5	4	{J}; {I} ; {B} ; {F}
4	6	{J}; {I} ; {B} ; {F} ; {E} ; {L}
3	3	{J, I, F, L} ; {B} ; {E}
2	6	{J, I, F, E, L} ; {B} ; {G} ; {D, C}; {N}; {K}
1	4	{J, I, F, B, E, L, G, D, C, N, H} ; {K}; {A}; {M}

[1]All faculty members within a group are linked directly or indirectly by at least as many common interests as the linkage strength.

If A and B share three common interests, then A, B is a group with linkage strength 3--A and B are linked directly by three interests.

If A and B share three common interests, B and C share four common interests, and A and C share only two common interests, then too {A, B, C} is a group with linkage strength 3. Even though A and C directly share only two common interests, they are linked indirectly by a chain of links through B, and the minimum strength of the links in the chain is 3.

A single person group is formed when the person has at least as many interests as the linkage strength, and (s)he does not share enough (equal to the linkage strength) interests with another person to form a group.

[2]Number of distinct groups of faculty with the corresponding linkage strength.

TABLE 5

Interest Groups

Linkage[1] Strength	Number[2] of groups	Groups
5	1	{OB}
4	3	{OB, OD}; {OT}; {Policy}
3	5	{OB, OD}; {OT}; {Policy}; {Mglbeh}; {Personnel}
2	2	{OB, OT, Policy, OD, Mgelbeh, Personnel, Resmeth, Mgted}; {Hlthcare}
1	4	{OB, OT, Policy, OD, Mglbeh, Personnel, Hlthcare, Resmeth, Mgted, MIS, Decsci, Opmgt, Smlbus, Mgtpro, M-FDyn, Orgpsy, Bussoc, Ldrbeh}; {Orgcom}; {Prodop}; {Stats, Mgtsci}

[1]All interests within a group are linked directly or indirectly by at least as many faculty members as the linkage strength.

If four faculty members have interests C and D, each with or without additional interests, C,D is a group with linkage strength 4--C and D are linked directly by four faculty members.

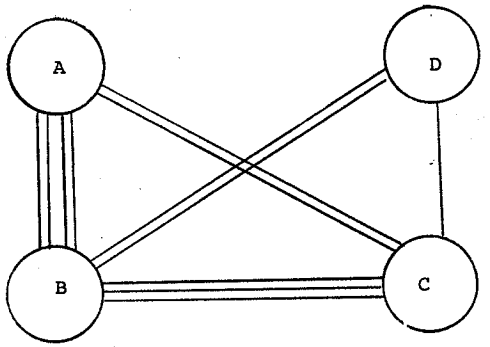
If four faculty members have interests C and D, three have interests D and E, and five have interests C and E, then {C,D,E} is a group with linkage strength 4. Even though D and E are linked directly by only three faculty members, they are linked by a chin of linkages through C, the minimum strength of a link in the chain being four.

A single interest group is formed when at least as many faculty members as the linkage strength have the interest, and not enough faculty members (equal to the linkage strength) have the particular interest in conjunction with another common interest.

[2]Number of distinct groups with the corresponding linkage strength.

FIGURE 1

Direct and Indirect Linkages Between Elements;
Illustrative Examples



Element Pair	Type of Linkage	Description	Weakest Link
A,B	Direct	A-(4)-B	4
A,B	Indirect	A-(2)-C-(3)-B	2
A,B	Indirect	A-(2)-C-(1)-D-(2)-B	1
Overall strength of A-B = 4			
A,C	Direct	A-(2)-C	2
A,C	Indirect	A-(4)-B-(3)-C	3
A,C	Indirect	A-(4)-B-(2)-D-(1)-C	1
Overall strength of A-C = 3			