

A FORCE FIELD APPROACH TO ASSESSING ORGANIZATION  
FOR INTEGRATED REGIONAL DEVELOPMENT

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1. Introduction

Research proposals have been made for studying issues of complex organization related to regional development using a five case-study approach. An earlier Paper<sup>1</sup> has described the basic structure of these proposals, their expected contributions, and has indicated the scope of the case descriptions which form the first output stage of the case studies. In addition it has presented an outline of the questions that will be addressed in the post-description stages of the research. In this Paper we present an analytic framework that is useful for considering these questions. This Paper is, therefore, to be seen as an elaboration of part of the earlier one. It is also a companion to two other Papers that examine related issues from complementary theoretical positions<sup>2,3</sup>.

In the following Section (Section 2) the problem of creating a well adapted regional organizational system is addressed generally. The benefits of devoting attention to this problem area are also indicated. The Paper goes on to describe (Section 3) a force field model which is helpful to analysis in this area. The final Section (Section 4) examines how this approach will be applied in practice.

2. Problems of System Adaptation

In approaching regional development from an organizational perspective we consider the system of regional organizations as embedded in a national setting and itself embedding organizational subsystems which are each concerned with a single regional activity. Both inside and outside of an integrated regional development context we expect the form of the regional organizational system to be a complex reflection of the national setting and of the particular activities ongoing in the region. The level of analysis we use is on the organizational units in the region and on the linkages that occur between them.

If we consider a region outside of the development context in a setting which has achieved a certain level of organizational sophistication we may expect the pattern of linkages occurring as having evolved over the years, changing as the nature of the region's activities has changed, or as characteristics of the national setting have changed. The introduction of an integrated development programme introduces a discontinuity into this evolutionary process. It introduces new activities and, following the definition of regional development we use, it involves organizational change to support the new development directions. However the major cause of discontinuity to the evolution process may not be because of the need to support new activities but because of the special pattern of organizational linkages that integrated development can be taken to imply.

We postulate here that an organizational system which is well adapted to an integrated development scheme is one in which the linkages for planning and coordination between organization units reflect the inter-dependencies between activities in the

region they are concerned with. This is a rather special requirement to regional development context. General development in none of the settings we have drawn our cases from has reflected this combined regional-industrial emphasis. Rather different main axes of linkages occur generally in the settings.

The creation of a regional organizational system which is well adapted in this sense may cause certain difficulties. The fundamental hypothesis of the approach described in this Paper is that these difficulties cannot be completely overcome. A completely adapted regional system therefore cannot be created. In principle organizational mechanisms could be created to support such a system. However the region still remains embedded in a national system which has evolved mechanisms devoted to support different patterns of linkages. This national setting will continue to support development outside of the region along traditional lines. To the extent that special mechanisms are created to support the region's adaptation to its development scheme, a lack of consonance between the regional system and the national setting may be introduced. There may be practical limitations therefore to the use of new means.

The position adopted here is that the region organizational system which emerges in the development situation is a compromise. It involves a trade-off between two potential sources of disbenefit

1) from a lack of adaptation of the regional system to the development scheme  
and 2) from a lack of consonance between the regional system and the national setting.

The severity of this problem will differ greatly between cases. It will depend on both the characteristics of the setting and those of the plan. However in principle the problem exists in all cases. This leads to the formulation of particular questions of interest. For each of the cases we want to learn.

- a) the extent of the potential problem or organizational gap between existing organizational linkages and a well adapted regional organizational system
- b) the means available in the national setting to help to bridge this gap
- c) the nature of the trade-off between the two sources of disbenefit that the emergent organizational system represents.

These questions cannot be answered other than qualitatively. This is not only because of the lack of an adequate data base but also because they do not lend themselves to precise operationalization. However even approached in this way valuable results should be achievable. At the level of description this approach will amplify in particular areas the general description which forms an earlier stage of output of the overall research programme. These areas are the identification of the different means used to create an adapted system and the factors in different national settings which support the use of these means.

Beyond the level of description some test will be made of the two main hypotheses used here. The first is that the 'organizational solution' is the result of a trade-off between national setting and scheme requirements. Verification of this will have implications for the design of new development schemes. It is of

methodological interest because of its potential applicability to all cases where complex organizational systems which are linked with a meta-system suffer sudden changes in their environments.

The second hypothesis to be tested is that the regional organizational system needs in its linkages to reflect activity inter-dependencies. Testing of this will be qualitative and may use subjective information from informants on where disfunctions are occurring in the preparation of the scheme.

We turn to a more precise formulation of these ideas.

### 3. The Use of a Force Field Model

A more precise formulation of this area of interest and of the questions to be answered is possible through the use of a simple force field model. In this model the organizational units of the regional system are represented as points with attractive or repulsive forces operating between them. The result of attractive forces is viewed not as a movement of the points but as a flow of information between them. The extent of information flow is seen as dependent on the size of the force. Where negative or zero forces operate no information flows. In order to understand the pattern of links occurring between organization units we need to understand the nature of the forces operating.

We postulate that the net force between two points is the resultant of positive forces (favouring a link) and negative forces (antagonistic to a link).

Considering points  $i$  and  $j$

$F_{ij} = F_{+ij} - F_{-ij}$  where  $F_{ij}$  is the resultant force

$F_{+ij}$  are positive forces

and  $F_{-ij}$  are negative forces

and a link  $L_{ij}$  exists where  $F_{ij} > 0$ .

We further hypothesize that the positive forces  $F_{+ij}$  depend upon two rather distinct components. To the extent that inter-dependencies  $A_{ij}$  exist between the activities unit  $i$  and unit  $j$  operate, the units are able to benefit by reducing the uncertainty of their environments by forming links. Also there may be factors in the national setting which favor such links :  $N_{ij}^+$ . These may relate to common ownership, legal obligations, tradition, etc. We have

$$F_{+ij} = f_1(A_{ij}, N_{ij}^+)$$

We can consider negative forces similarly. We have parallel characteristics in the setting discouraging links  $N_{ij}^-$ . In addition we can recognize that forming links involves a loss of autonomy for both units, which from their point of view is undesirable.  $I_{ij}$  is used to represent this joint loss of autonomy.

We have:

$$F_{ij}^- = f_2(I_{ij}, N_{ij}^-)$$

and

$$F_{ij} = f_1(A_{ij}, N_{ij}^+) - f_2(I_{ij}, N_{ij}^-)$$

The determination of the forces  $F_{ij}$  for all pairs of  $i$  and  $j$  would enable us to map the organizational linkages in the system. The particular pattern of linkages is a quasi-stable state and represents the most favoured position from the point of view of the organization units.

With the introduction of a regional development scheme new activities are introduced and new units may also be. From the point of linkages, the most significant change we have postulated is that linkages should reflect activity inter-dependencies. In terms of the force analogy,

$$F_{ij}^* = f_3(A_{ij}^*)$$

where  $F_{ij}^*$  is the desired force between units  $i$  and  $j$ , and  $A_{ij}^*$  the activity inter-dependencies in the development situation.

Our field-force analogy allows us to see that some adaptation will take place in the region quite naturally as a result of the change in activities. Thus

$$F'_{ij} = f_1(A_{ij}^*, N_{ij}^+) - f_2(I_{ij}, N_{ij}^-)$$

where  $F'_{ij}$  is the modified force.

However generally

$$f_3(A_{ij}^*) \neq f_1(A_{ij}^*, N_{ij}^+) - f_2(I_{ij}, N_{ij}^-)$$

$$\text{and } F_{ij}^* \neq F'_{ij}$$

We can say that there is a potential inconsistency between the linkages required by the scheme, and the linkages that will naturally arise. The extensiveness of this potential inconsistency will vary between cases, depending on both the characteristics of the national setting and the characteristics of the particular scheme.

It is reasonable to suppose that at the stage of policy formulation for the scheme steps will be considered to reduce this inconsistency. This is the organizational response that is embodied in our definition of integrated regional development. In terms of our analogy this involves using mechanisms which can be represented as new forces  $M$ . The desired situation is:

$$f_3(A_{ij}^*) = f_1(A_{ij}^*, N_{ij}^+) - f_2(I_{ij}, N_{ij}^-) + M$$

We can distinguish two types of forces. The first, and perhaps, most useful we designate as means of implementation which are consistent with the national setting  $M_c$ . What we mean by this are means which are generally recognized in the national setting as valid and probably have been used elsewhere - their effectiveness has been established. A particular property of  $M_c$  is that it is not seen as altering the national setting. That is, the use of  $M_c$  does not alter  $N+$  or  $N-$ . For these reasons  $M_c$  may be thought of as a desirable means. Again settings will differ in the availability of such means. In general they may not be sufficient to achieve the desired match in linkages. That is:

$$f_3(A^*_{ij}) \neq f_1(A^*_{ij}, N+_{ij}) - f_2(I_{ij}, N-_{ij}) + M_{cij}$$

To achieve the desired match a new set of means are in principle available. The new means, presented as forces  $M_{NEW}$ , are thought of as being inconsistent with the national setting. This has two consequences. Firstly, to the extent that they are new and not used elsewhere, their effectiveness must be uncertain. Secondly, by their use, the characteristics of the national setting may be altered. That is,  $N+$  and  $N-$  become  $N'+$  and  $N'-$ . This in turn leads to further uncertainty about their net effect on the regional system.

Because of these undesirable properties, as a hypothesis we can suppose that their use is limited and that in general they do not achieve perfect matching between the linkages that the scheme implies and actual regional organization linkages.

This is the compromise in the organizational solution which has been referred to. It is represented

$$f_3(A^*_{ij}) \neq f_1(A^*_{ij}, N'+_{ij}) - f_2(I_{ij}, N'-_{ij}) + M_{cij} + M_{NEWij}$$

$$F^*_{ij} \neq F'_{ij}$$

and  $L^*_{ij} \neq L'_{ij}$

where  $L^*_{ij}$  are desired linkages and  $L'_{ij}$  the actual ones.

Some Comments on this Formulation

1. Linkages have been presented as if they were uni-dimensional. We recognize, of course, that linkages may perform different functions, for example, integrating or co-ordinating, and that a multi-organization map should re-recognize this. So, we recognize that parallel expositions need to be made for each type of link.

2. Our presentation has emphasized the point of time at which the regional development has been introduced. These new forces are required not only to create the new situation but also to maintain it. We extend this further to postulate that even when the creation of the development scheme was too far back to support the prior-to-scheme analysis, or when the scheme was introduced into totally virgin territory, an essentially parallel analysis can be carried out by reference to other current regions in the national setting where regional development has not been introduced. The limits on this are set by the extent to which units within the development scheme are able to recognize other units outside which they regard as similar to themselves and which present a viable model for themselves outside of the development context.
3. The presentation could be taken as implying the possibility of elaborating the force functions and applying a quantitative approach. In fact this is not the case. The algebraic notation has been used because of the clarity with which it allows the ideas to be expressed. Practically, the analysis will be carried out using the data base contained in the case descriptions and will be qualitative. Some of the separate components of the force functions will not be separately distinguished.

### 3. Practical Application of the Approach

An earlier Paper has given the scope of the case descriptions which will form the first stage of output of each case study. Here, only an outline of the main components of that will be given.

1. Delineation of regional activities;
2. Delineation of regional organizations;
3. Mapping of linkages of various types in the post-development context:  $L'_{ij}$  (where the scheme is already operating).
4. Mapping of linkages of various types in the pre-development scheme context  $L_{ij}$ . Where the scheme is not yet implemented this is straightforward. For established schemes it may be partial and may rest heavily on outside-of-the-region patterns.
5. Implementational mechanisms used:  $M(M_C$  and  $M_{NEW}$  unseparated).

6. In cases where  $L_{ij}$  or  $L'_{ij}$  do not exist discussions with units  $i$  and  $j$  of the significance of this. How powerful are or were the barriers preventing such links? What were the main considerations behind this? Where a new link has been formed ( $F_{ij} < 0$ ,  $F'_{ij} > 0$ ) how effective is this link? What were the specific factors leading to its formation?
7. From direct examination of statements of the policy for development, from discussion with policy makers and from discussions with the regional organizations, we need to establish the perceived interdependencies between regional activities  $A^*_{ij}$ . We would hope to establish the order of magnitude of the inter-dependencies and whether they operate on a short or long time-scale.
8. From policy making units, and research institutes we would hope to establish the nature of the mechanisms of implementation. In particular we would want to establish which are the consistent means  $M_C$  and which means were created to deal specially with the regional development situation:  $M_{NEW}$ . For the set of  $M_C$  we would want to learn in a general way about the influence of each. For the  $M_{NEW}$  we would ask about how effective they are proving, and any problems that have arisen.

### C. The Analytic Questions

Three issues have been referred to:

The first refers to the potential consistency gap that was opened up by the scheme. It refers to the set of inequalities

$$F_{ij} \neq A^*_{ij}$$

Information from 4., 6. and 7. relate to this issue.

The second issue concerns the set of consistent means available to the setting  $M_C$ . 8. supported by 6. relate here.

The third issue concerns the nature of the trade-off between different sources of inconsistency that the 'organizational solution' represents.

The inconsistency between regional organizations and the development scheme, the set of

$$F'_{ij} \neq A^*_{ij} \text{ is supported by 3. and 7.}$$

The inconsistency between the regional organization and the national setting relates to M<sub>NEW</sub>. Its determination is supported by 5. and 8.

References

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