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Kyösti PULKKINEN

**Some Organizational and Communicative Aspects of Information
Processing for Decision-making**

Niektóre organizacyjne i komunikacyjne problemy przetwarzania informacji
decyzyjnych

Некоторые организационные и коммуникабельные проблемы
переработки решающих информаций

Many of the present problems met by Information Resource Management when trying to provide more effective information for decision-making are caused by organizational and communicative factors. The trend in the organization towards specialization, decentralization and differentiations is problematic for coordination of operations. The phenomenon of differentiation is also evident in communication. The means offered by Information Processing, Management Information Systems, and especially, Decision Support Systems are moving towards a Knowledge Representation capable of integration in the organization. This progress is most welcome in striving to overcome these problems.

PROBLEM AREA TO BE DISCUSSED

In principle, management is responsible for the firm's information resources and for this responsibility a special sector of management, Information Resources Management has been established in many firms. Implementation of efforts in this area confronts many problems. The management makes changes in organization, e. g. owing to new corporate strategies. In addition the organization itself develops, especially owing to new business that causes growth in operations. Expectations with respect to knowledge change accordingly. These developments

therefore have a great impact on the success achieved in using the knowledge at the disposal of the organization.

This paper is focused on the relationship between organizational as well as communicative development on the one hand, and progress in Information Processing towards Decision Support Systems and in this connection towards more effective Knowledge Representation in the firm, on the other.

THE PHASES OF ORGANIZATIONAL DEVELOPMENT

There are several approaches to study developments in organization relevant to the problems at hand. First, the classical models of thinking that lead to certain solutions for the design of the organizational structure could be used here. The contingency approach could also be useful, as the two important states of the contingency variable in question are most characteristic: states of differentiation and integration between the organizational units. The discussion concerning „Organization Development” (OD) could also offer a useful frame of reference. The analyses of the structure and process of the organization could clearly stress the importance of handling the firm’s knowledge when the circumstances of the organization are being changed.

However, the phases of development of an organization have been chosen here as the first subject of study. As can be expected, the theories and models concerning this development have been based on the literature of various disciplines. Attention has rather often been focused on corporate growth. As regards the model based on the natural sciences, we might mention the emergence of the often used life-cycle concept. It is an „organistic” theory of growth close to another important growth theory, the evolutionary theory. The life-cycle concept is now applied.

There are many classifications in the literature that concern certain phases in the development of a growing organization, as this way of analyzing its life-cycle is used continuously. The division into five classes by Greiner (1972) is probably still the most common today. He mentions the following phases: (1) Growth through CREATIVITY, which ends in the crisis of leadership. (2) Growth through DIRECTION, which ends in the crisis of autonomy. (3) Growth through DELEGATION, which ends in the crisis of control. (4) Growth through COORDINATION, which ends in the crisis of red tape. (5) Growth through COLLABORATION is the last phase where social control and self-discipline take over from formal control.

Some other classifications in the literature might also be helpful now

as they — following the details stressed by Greiner in principle — summarize some aspects in the formation of the structure and process of a growing organization in modern societies. E. g. Lievegoed (1973, 51) divides the development of an enterprise into three phases: (1) The Pioneer Phase, (2) The Phase of Differentiation, and (3) The Phase of Integration.

Lievegoed stresses that these phases of development can be concurrent in society and also among the departments of a large organization. The „pioneer phase” can be found in the history of nearly all medium-sized companies where „the objectives of the company are visible down to the lowest level. Each person knows what he contributes to the achievement of the objectives and how successful he is doing so” (Lievegoed 1973, 57). The importance of the institutionalization of the firm’s objectives in the „pioneer phase” can be stressed. It is then that the first strategies — and no doubt very important ones — are planned, formulated and implemented.

When describing the „phase of differentiation”, Lievegoed mentions that differentiation leads of necessity to a diversity of parts which have to be bound together and oriented towards the company’s objective. In the „phase of integration” the necessary integration of the different parts of the organization is reached by the growth of communication.

Let us now concentrate our attention on only a couple of factors. These are structural development and development in communication. Comparison of the phases in the classifications by Greiner and Lievegoed reveals the same two categories. The first category, comprising phases 1, 2, and 3 by Greiner, and phases 1 and 2 by Lievegoed, concerns development of structure and the latter, containing phases 4 and 5 by Greiner and phase 3 by Lievegoed, can be regarded as dealing significantly with communicative circumstances.

The first category stresses structural development progressing at the end to differentiation, which is in many cases the result of decentralization. The second category stresses the importance of communication in integration efforts after differentiation of work. Greiner mentions that the crisis of control at the end of his third phase leads to his fourth phase, „growth through coordination”. There the need for communication grows rapidly. Applications of line-staff solutions as well as of product groups in the organization, as Greiner mentions, are no doubt helpful in the effective coordination of activities. In Greiner’s fifth phase organizations aim at collaboration, and e. g. matrix solutions are helpful when improving connections between organizational units.

In the literature there are also classifications concerning the characteristics of corporate strategies in the various developmental phases of

the organization. E. g. Thompson and Strickland (1983, 318) have given a classification which follows more or less closely the ideas of the above mentioned authors. The turning point in this classification is the same as in previous ones: the approach to integration on the communicative level after the differentiation has reached a high degree.

COMMUNICATIVE DEVELOPMENT

It can be emphasized that the need for information, and thus the requirements for improving knowledge in the organization, differ significantly in a situation representing centralization compared with a situation of decentralization and differentiation.

In structural differentiation a situation of non-differentiation in communication — as we now call it — is welcome for a management which coordinates the operations. The opposite case, differentiation in communication, prevails when clusters of communication links between members of an organization have many inside contacts — as it is usually the case between members of a working group — but only a few links between clusters. The absence of differentiation, when there are also many links between organizational clusters, is the phase now in question. Studies indicate that this phase comes, in accordance with the classifications of the structural development phases described above, when integration is needed after differentiation. (Pulkkinen 1981, 32)

But communicative development is also proceeding. In a situation when there is no differentiation, the members of the organization often perceive — as studies also indicate — that they desire for more relevant information in spite of the many links in communication clusters and between them. This desire can be stated even in decision-making events where the programs — or routines — are determined in advance. It is natural that when the needs for information are sophisticated, they are perceived as even more compelling (Pulkkinen 1981, 47; 1982, 101). In such cases decision-making is usually not based on a predetermined program. This type of decision-making can often be classified as based on the use of open decision models where the search for satisfying outcomes instead of efforts to optimize is involved (Simon 1957, 241).

DECISION SUPPORT BY INFORMATION PROCESSING

The Information Systems of the firm have the task of delivering information to users in collaboration with communication in the organization. Planned systems of this kind have already been functioning in

firms for a long time. Management Information Systems (MIS) are an example of explicit planning of these systems for certain special purposes. The task of these systems is to cover management's total need for information concerning the operations of the firm. (Blumenthal 1969, 36).

A decade ago, a new philosophy of how the Information Systems could be used to support managerial decision-making emerged under the name Decision Support Systems. This concept was introduced in 1971 (Gorry and Scott Morton 1971) as a class of information systems intended for direct use by decision makers and their staffs. These systems incorporated analytical capabilities as well as traditional data access and reporting capabilities to aid in decision-making. According to a well-known definition (Keen and Scott Morton, 1978, 97). DSS are computer-based support for management decision-makers dealing with semistructured problems. Systems of the same kind operating without computers have rather often been taken into consideration as models for thoughts. Thus the following discussion concerns computerized systems, but also as systems functioning without computer as analogical models.

The most primitive support given by DSS provides access to facts or information retrieval. The second level of support involves the addition of filters and pattern-recognition ability to this data retrieval. The third level adds more generous computational facilities to the first two, and permits the manager to ask for simple computations, comparisons and projections. The final level of support provides useful models to the manager (Keen and Scott Morton 1978, 97).

It is now important to stress that DSS has become the object of many studies and practical applications, also owing to its capability to create dialogue between the information resources concerning the knowledge needed and the user, the decision-maker himself. This dialogue — whether a concept on the theoretical level or realized „discussion” in practical operations — has attracted attention to the phenomenon of Knowledge Representation, which is the most relevant factor in the problems described above at the beginning of this paper.

KNOWLEDGE REPRESENTATION IN COMMUNICATIVE INTEGRATION

The concept of Knowledge Representation has been mainly defined in the literature by researchers dealing with Artificial Intelligence. Thus these definitions provide analogies for approaching the contents of the concept rather than exact definitions for general purposes. „Representa-

tion of knowledge is e. g. a combination of data structures and interpretative procedures that, if used in the right way in a program, will lead to 'knowledgeable' behaviour". (Barr and Beigenbaum 1981, 143) Or „a representation is a set of conventions about how to describe things." (Winston 1979, 15)

The basic element in knowledge representation is the knowledge itself. It is most important that the Decision Support Systems, when they have a continuous dialogue with the user, are able to find knowledge represented in a way relevant to his needs.

Representation techniques (Pulkkinen 1985) that are of importance here have been widely discussed in research on Artificial Intelligence. They are, however, also well known in human activities. Man collects information — we call it semantic knowledge — through his own senses and by receiving information on the perception of others. This activity is based on his own models and methods of thinking. In order to be of real use, knowledge representation must be able to provide problem processing with things, phenomena, and concepts, as well as with the relations between them in the surrounding world. It is essential that the representation of knowledge corresponds to the decision-maker's own models and methods of thinking.

This paper deals with the responsibility of the Information Resource Management (Synott and Gruber 1981) to provide more effective information under the pressure of organizational and communicative change. The trend in organization towards specialization, decentralization and differentiation was discussed as well as the integrating role of communication when management strives for the necessary coordination in operations.

We stress that the above survey has given us one recommendation that can be regarded as safe. It would be most important to pay attention from the beginning of a firm's operations to the fact that knowledge developing towards differentiation owing to structural specialization and decentralization can also be used in an integrated way after certain development phases of the organization. All measurements which can be taken at an early state to facilitate such an integrated use are very valuable.

The discussion about Decision Support Systems has been most helpful when approaching the practical activities of Information Resources Management having the task of ensuring relevant information for effective coordination of the firm's operations. In this discussion the role of Knowledge Representation is most vital.

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STRESZCZENIE

Autor w swym opracowaniu zajmuje się powiązaniem między rozwojem w dziedzinie organizacji i komunikowania się ludzi a postępem w procesach przetwarzania informacji skierowanym na tworzenie informacyjnych systemów wspierania decyzji (Decision Support Systems). Powiązania te są omawiane w następujących częściach: 1) fazy rozwoju organizacyjnego, 2) rozwój procesów komunikowania się ludzi, 3) wspieranie decyzji przez procesy przetwarzania informacji, 4) rola wiedzy w integracji organizacyjnej za pomocą procesów komunikowania się.

РЕЗЮМЕ

Настоящая статья посвящена связям между развитием в области организации и коммуникации людей, с одной стороны, и процессом переработки информации, направленным на создание информационных систем поддержки решений (Decision Support Systems), с другой. Эти связи автор рассматривает в следующих частях: 1) фазы организационного развития, 2) развитие процесса коммуникации между людьми, 3) поддержка решений через процесс переработки информации, 4) роль знаний в организационной интеграции при помощи процессов коммуникации.