

Polska
Akademia
Nauk
Instytut
Badań
Systemowych

Methodology and applications of decision support systems

Proceedings of the 3-rd
Polish-Finnish Symposium
Gdańsk-Sobieszewo, September 26-29, 1988

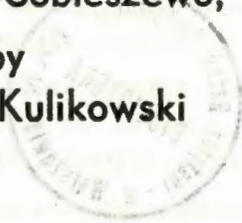
edited by
Roman Kulikowski





Methodology and applications of decision support systems

Proceedings of the 3-rd
Polish-Finnish Symposium
Gdańsk-Sobieszewo, September 26-29, 1988
edited by
Roman Kulikowski



Secretary of the Conference
dr. Andrzej Stachurski

Wykonano z gotowych oryginałów tekstowych
dostarczonych przez autorów



41267

ISBN 83-00-02543-X

INTER-ORGANIZATIONAL INFORMATION SYSTEMS IN THE LIGHT OF THE TRANSACTION COST THEORY

REIMA SUOMI

Turku School of Economics and Business Administration

Sampo Insurance Company Limited
P.O. Box 216, SF-20101 Turku, Finland

Abstract: Inter-organizational information systems are the area of information systems that promise to bring in big changes for operations that are shared by at least two organizations. The new concept can be studied both from technical or competitive point of view. This study tries to give some guidelines for the build-up of inter-organizational systems primarily concerning the competitive viewpoint, i.e. how can inter-organizational information systems be built and used in order to make the running of a company more effective and in that way more competitive and profitable.

Since the concept of inter-organizational information systems has no established background theory, the transaction cost theory is presented as one possibility for such a theory. Concentrating on minimizing transaction costs - the thing inter-organizational information systems just try to do - this theory seems especially suitable for this purpose.

Content:

1. Basic concepts
- 1.1 The transaction cost approach
- 1.2 Inter-organizational information systems
2. Which are the the transaction costs caused by communication between two organization
3. How can information technology eliminate transaction costs

1. Basic concepts

1.1 The transaction cost approach

The transaction cost approach provides a fruitful platform for studies of most economic relations. It is a discipline having its roots in law, economics and organization. But first during the last few years research results from these three disciplines have been collected to a covering theory. Much of this work is credited to **Oliver E. Williamson**¹, who calls this process "the revival of interest in the New Institutional Economics".^{2 3} Whereas earlier theories have explained economic institutions by reference to things such as class interests, technology or monopoly power, *the transaction cost approach maintains that these institutions have the main purpose and effect of economizing on transaction costs.*⁴

Transaction cost approach (TCA) rests on the following assumptions⁵:

1. *The transaction is the basic unit of analysts.*
2. *Any problem that can be posed directly or indirectly as a contracting problem is usefully investigated in transaction cost economizing terms*

¹ Williamson has written over 30 articles or books on the theme, including the newest books "Markets and Hierarchies: Some elementary Considerations" (1975) and "The Economic Institutions of Capitalism. Firms, Markets, Relational Constructing" (1985)

² Williamson 1985, 3

³ By New Institutional Economics is meant study of economic organizations of all kind

⁴ Williamson 1985, 1

⁵ Williamson 1985

3. *Transaction cost economics are realized by assigning transactions (which differ in their attributes) to governance structures (which are the organizational frameworks within which the integrity of a contractual relation is decided) in a discriminating way. Accordingly*
 - a) *the defining attributes of transactions need to be identified*
 - b) *the incentive and adaptive attributes of alternative governance structures need to be described*
4. *Although marginal analysis is sometimes employed, implementing transaction cost economics mainly involves a comparative institutional assessment of discrete institutional alternatives - of which classical market contracting is located at one extreme; centralized, hierarchical organization is located at the other; and mixed modes of firm and market organization are located in between.*
5. *Any attempt to deal seriously with the study of economics organization must come to terms with the combined ramifications of bounded rationality and conjunction with a condition of asset specificity.*

The basic distinction of TCA between different organization forms is the distinction of markets and hierarchies. Markets and hierarchies are form of **economic organizations**. Economic organizations control and coordinate human activities, given the division of labor.

A market is an assemblage of persons who want to arrange the exchange of property, where prices serve as both coordinating guides and

incentives to producers in affecting what and how much they produce - as well as the amount they demand. At the equilibrium free-market price the amounts produced equal the amounts demanded - without a central all knowing authority.⁶

In a hierarchy (firm) market transactions are eliminated and in place of the market structure with exchange transactions is substituted the entrepreneur-coordinator, the authority, who directs production.⁷

Transaction costs are cost caused by conducting business transaction. They are *the costs of running the economic system*.⁸ Whereas all kinds of costs, they inhibit economic activities. Conventional accounting and organizational design has traditionally focused on production costs, and that's why there is reason to pay extra attention to the concept of transaction costs.

The two models of human behaviour, bounded rationality and opportunism are central to the theory of TCA. As a whole, *transaction cost economics is self-conscious about its behavioral assumptions*.⁹ Bounded rationality is one possibility in a taxonomy of different rationality amounts of an author. Opportunism refers to the self-interest seeking behaviour of the actor, being again one possibility among many others.

Bounded rationality refers to the state, where an actor taking part in an transaction tries to be rational, but because of missing information or

⁶ Alchian & Allen 1977

⁷ Coase 1937

⁸ Arrow 1969, 48

⁹ Williamsson 1985, 18

other factors, his behaviour don't seem fully rational to outside observers. The actor is intendently rational, but only limitedly. He tries to be rational, but don't have all possibilities to be fully rational. Limits on rationality must not be interpreted as nonrationality or irrationality.

Opportunism means *self-interest seeking with guile*.¹⁰ Actors conducting a transaction even exert themselves to mislead, distort, disguise, obfuscate or otherwise confuse the other part or the transaction. It leads to **information asymmetry**, a state in which the other actor knows more than the other.

Both bounded rationality and opportunism are bad things that should be eliminated. Partly they are involved in human nature, but since they have to do with insufficient of missing information, information technology can contribute to the elimination of these factors that cause transaction costs.

To sum up, TCA should be credited with at least the following clear advantages:

- 1) its formulation of a comprehensive and established framework
- 2) its focus on industry-wide questions
- 3) understanding of cooperative decision-making, not only individual decision making.

¹⁰ Williamsson 1985, 47

1.2 Inter-organizational information systems

A well established assumption is, that an information system (IS) is always connected with the one and only organization it serves. This has had some consequences, which have made it easier to control IS:

- 1) An organization can always fully control its IS
- 2) The costs of the IS can always be assigned to the single organization, as also can the benefits that result

A big step away from this ideal picture was taken at the advent of decentralized IS's. Albeit under the same parent organizations, ISs were controlled by separate organization units often having contradictory needs. Complicated procedures had to be developed to assist in the allocation of costs and benefits caused by IS's.

As multitudes of new organizational units developed, it would have been possible to develop and consider the concept of inter-organizational information systems (IOS's). But it is easy to assert that the term started with the deregulation of data communications and the development of modern data communications technology.

A diversified and complicated organization surely needs internal data communication. Automation of the flow of routine data is being accomplished in nearly all organizations. But why limit this to the inside of the organization, when we are living in a world of interdependence? *Company boundaries are not the only, or ever,*

the most meaningful, system boundaries. Therefore, even though internal systems may still be far from totally integrated, perceptive management needs to begin to consider the new possibilities for coordinating data processing outside its own organizational limits¹¹.

Transaction costs mostly occur from transaction between two business partners. That's why TCA comes to full value on studies on inter-organizational information systems, that is systems that cross traditional company boundaries. Research on information systems based on TCA can also often be found under keywords such as strategic networks, organizational structures, coordination etc.

¹¹ Kaufman 1965, 141

2. Which are the the transaction costs caused by communication between two organization

There are several classifications of transaction costs. Here we briefly present some of them:

Transaction costs are caused by **asset specificity** and **complexity of product specification**.

Asset specificity refers to the situation where an input used by a firm (or individual consumer) *cannot readily be used by other firms because of site specificity, physical asset specificity or human asset specificity*.¹² In addition these types of specificity, Malone, Yates and Benjamin introduce the concept of **time specificity**.¹³

Site specificity occurs for example when a natural resource is available only locally, and its transportation is impossible or expensive. For example turf as energy source is a site specific asset.

Physical asset specificity occurs when the design and/or construction of a resource is so individual that it can only be used for one purpose. A complex company-wide information system as a whole is typically asset specific.

Human asset specificity comes along with specialization. The skills of a lion-tamer are of no use for most companies.

¹² Williamsson 1981

¹³ Malone & al 1987

Time specificity comes in when we speak of resources that can get old. Most of information or tomatoes are typically time specific resources.

Complexity of product description refers to the amount of information needed to specify the attributes of a product in enough detail to allow potential buyers (whether producers acquiring production inputs or customers acquiring goods) to make a selection¹⁴.

The two frameworks of different organization forms and transaction/production costs are integrated by the assumption that in markets, transaction costs are high but production costs are low, and vice versa. ¹⁵

In markets, most capable suppliers and customers are free to meet, and in production economics of scope can be obtained. There may, however, exist high transaction costs, when customers and suppliers look for each other.

In hierarchies, on the other hand, business partnerships rest on long-term established contracts. Thus transaction costs are minimized. On the other hand it is not sure that the suppliers and customers that do business with each other suit each other best. And if this had been the original situation, the stability of the relation makes it rigid to changes in markets.

This situation has led to situation where industries where transaction

¹⁴ Malone & al 1987

¹⁵ Malone & Smith 1984

costs are high tend to do business on a hierarchy basis, whereas industries with low transaction costs can organize themselves to markets.

Mark Casson differentiates between six types of transaction costs¹⁶:

- 1) information costs
- 2) costs caused by requirement analysis
- 3) costs caused by negotiating
- 4) costs caused by initiating the transaction
- 5) costs caused by monitoring the transaction
- 6) costs caused by making the transaction legal.

Thomas W. Malone differentiates between coordination and vulnerability costs, as two forms of transaction costs, in addition to production costs¹⁷. Coordination costs are the costs of maintaining communication links between actors and the costs of exchanging messages along these links. Production costs are the costs of production capacity and costs of delays in processing tasks. Vulnerability costs are the unavoidable costs of a changed situation that are incurred before the organization can adapt to a new situation.

¹⁶ Casson 1982

¹⁷ Malone 1987

3. How can information technology eliminate transaction costs

Information systems are used to make information flow fluent and cheap. Since most transaction costs are caused by insufficient or missing information or costly processing of it, information systems are devices to descend transaction costs. *Information technology belongs to those technologies, like the telephone and money itself, which reduce the cost of organizing by making exchanges more efficient: It is thus a mediating technology, i.e. a technology that links several individuals through standardization and extension of the linkages.*¹⁸

Williamsson sees technology - also information technology - as one factor affecting transaction costs. *A transaction occurs when a good or service is transferred across a technologically separable interface. With a well working interface, as with a well-working machine, these transfers occur smoothly. In mechanical systems we look for frictions: so the gears mesh, are the parts lubricated, is there needless slippage or loss of energy. The economic counterpart of friction is transaction cost.*¹⁹

Information technology makes it possible to lower transaction costs. This is caused by the three effects of information technology presented by Malone & al.²⁰

- 1) The electronic communication effect
 - more information can be collected in the same amount of time (or same amount in less time)

¹⁸ Thomson 1967

¹⁹ Williamsson 1985, 1

²⁰ Malone & al 1987

-costs of communication will be decreased
dramatically

2) The electronic brokerage effect

-number of that can be considered increases
-the quality of the alternative eventually selected
will be improved
-the costs of the entire product selection process
can be reduced

3) the electronic integration effect

-different activities in value chain will be coupled
together more closely

To sum up, traditionally organizations have used information technology in order to develop their internal efficiency. The use of inter-organizational systems will affect the efficiency of the total market mechanism. When striving for market efficiency, organizations at the same time contribute to their own competitive success, since the companies introducing the most sophisticated inter-organizational information systems will clearly be best off in competition. So, inter-organizational information systems are a means to link efficiency considerations with the competitive advantage point of view.

REFERENCES:

Alchian, R.A. - Allen, W.R (1977) Exchange and Production: Competition, Coordination and Control. Balton Wadsworth Publishing Company.

Arrow, Kenneth (1969) The organization of economic activity; issues pertinent to the choice of market versus nonmarket allocation. On The analysis and evolution of Public Expenditure: the PPB System vol. 1 U.S Joint Economic Committee, 912st Congress, 1st session. Washaington D.C, 59-73.

Casson, Mark (1982) The entrepreneur. An economic theory. Oxford.

Coase, R.H. (1985) The nature of firm. Economica 4/37, 386-405.

Kaufman, Felix (1966) Data Systems That Cross Company Boundaries. Harvard Business Review January-February 1966, 141-155.

Malone, Thomas W. - Yates, Joanne - Benjamin, Robert I. (1987) Electronic markets and electronic hierarcies. Communications of the ACM June/1987, 484-497.

Malone, Thomas W. (1987) Modelling coordination in organizations and markets. Management Science October/1987, 1317-1332.

Malone, Thomas W. - Smith, S. (1984) Tradeoffs in designing organizations: implications for new forms of human organizations and computer systems. CISR WP 112, Sloan WP 1541-84. Center for Information Systems Research, Sloan School of Management, Massachusetts Institute of Technology, Cambridge, Mass.

Thomson, J.D. (1967) Organizations in Action. Russell Sage. New York.

Williamsson, O.E. (1975) Markets and Hierachies: Some elementary Considerations. The Free Press.

Williamsson, O.E. (1985) The Economic Institutions of Capitalism. Firms, Markets, Relational Constructing. The Free Press.

Williamsson, O.E. (1987) The Economics of Organizations: The Transaction Cost Approach. American Journal of Sociology. Nov/81, 548-575.



IBS

41267