

## THE LEGITIMACY OF INFORMATION SYSTEMS DEVELOPMENT - A NEED FOR CHANGE ANALYSIS

Göran Goldkuhl & Annie Röstlinger

Human-infological Research Group (HUMOR)  
Department of Information Processing  
Chalmers University of Technology  
S-412 96 Göteborg, Sweden

### Abstract

The decision on whether to develop computerized information systems or not must be made in a rational and transparent way. This kind of decision process is called change analysis. If a computerization decision is taken without a proper change analysis, then such a change action is not organizationally legitimate. A methodology for change analysis is presented consisting of problem analysis, goal analysis, change requirement analysis, change action determination and activity analysis. Some applications of and experiences from method use are noticed.

Paper presented at First IFIP Conference on Human-Computer Interaction, 4-7 September 1984, London

This research work has been financially supported by The National Swedish Board for Technical Development

## THE LEGITIMACY OF INFORMATION SYSTEMS DEVELOPMENT - A NEED FOR CHANGE ANALYSIS

Göran Goldkuhl and Annie Röstlinger

Human-infological Research Group (HUMOR)  
 Department of Information Processing  
 Chalmers University of Technology  
 S-412 96 Göteborg, Sweden

The decision on whether to develop computerized information systems or not must be made in a rational and transparent way. This kind of decision process is called change analysis. If a computerization decision is taken without a proper change analysis, then such a change action is not organizationally legitimate. A methodology for change analysis is presented consisting of problem analysis, goal analysis, change requirement analysis, change action determination and activity analysis. Some applications of and experiences from method use are noticed.

## 1. INFORMATION SYSTEM DEVELOPMENT - LEGITIMATE CHANGE ACTIONS?

The decision on information system development is not an unproblematic one. The decision whether to computerize some parts of the enterprise's work or not, can be made with different degrees of rationality. The development of computerized information systems (CIS) can be seen as an attempt to resolve some organizational goals. To make this decision on computerization rational, these different problems and goals must be made explicit. There can be other ways of resolving certain organizational problems than by computerization. Before one starts a CIS development process, a decision process must be accomplished.

CIS development is one type of human action. Is such an action (in a specific situation) organizationally legitimate? Are there clear reasons and motives for performing this kind of action? To legitimate a human action, one must explain and justify it (4, 10). However, many times CIS development efforts seem to start from rather vague ideas and needs. The decisions on CIS development are often made rather implicitly. The decisions are thereby not rationally legitimated. Vague ideas on CIS solutions to organizational problems are unfortunately often taken for granted and not problemized.

There is a need for a separate stage or area before CIS development, where this kind of decision is developed and made. Work in this area can lead to a decision to develop computerized information systems. But it can also lead to other types of change actions. This is an initial stage general for many types of organizational problems and changes. We call this area change analysis (CA).

Is change analysis important for information systems science and practice? We claim that it is

very important. A systems designer that develops a CIS without considering the reasons for this CIS investment is becoming a "mere technician". He can develop a CIS that is solving the wrong problem; just aiming at symptoms. He is then (not totally, but) partly responsible for this kind of CIS failure. A systems designer, as a morally responsible agent, cannot take vague CIS-solutions to ill-stated organizational problems for granted. If nobody else does it, he must force a problemization of this kind of solution. He must require a rational legitimacy of this CIS development decision. From the view point of a systems designer: change analysis is an investigation of the motives, conditions and postulates for specific CIS developments. This will lead to a rational (i.e. well-grounded) decision whether to develop CIS or not.

A change analysis process must involve identification, formulation and diagnosis of problems, reconstruction and analysis of goals and values, and creation and evaluation of change requirements and change actions.

To have a legitimate decision on CIS development the different problems, goals, change requirements and anticipated consequences (of the changes) must be well described. These form together a basis for the legitimacy of the specific change action. A prerequisite for a rational decision of this kind is that the structure of problems and goals etc (i.e. the decision motives and postulates) is visible. The decision process must be transparent.

Let us continue to describe different factors for making the decision process rational and thereby the decision result legitimate. The legitimation should not be solution biased. In this case we have a back-wards legitimation. A change analysis process perhaps starts from some solution ideas. If we are only searching for favourable factors (problems, consequences, etc) that justi-

fy these solutions, then we are performing a solution biased legitimation. Instead we must put our solution ideas into brackets and only let them govern the delimitation of our problem area. We must then search for and identify problems in a "presuppositionless" manner. The problem analysis should be as comprehensive as possible. We must take a critical stance against solution ideas in order to distinguish between good and bad ideas. This can only be made if we are open-minded towards the fragility of our own ideas.

The decision developed through a change analysis should be characterized as a reflected action. A proper change analysis should avoid the two extremes: Verbalism (reflection without action) and activism (action without reflection).<sup>(6)</sup> Verbalism is in this context fact-collections and surveys leading to no other result than pre-study reports. No succeeding action is taken. Many people reacting to this kind of nonaction, instead take an "activism" position: "Here we do not make a lot of investigations. We are result oriented. We act". This kind of action without enough reflection usually has different consequences as e.g. curing symptoms, solving the wrong problems, getting unpleasant surprises, repeating old mistakes.

A proper change analysis is a synthesis between these extremes. A change analysis involves a rational investigation leading to well-grounded decisions and actions.

When we are talking about rationality in change analysis, we do not take a rationalistic position. We reject a mechanistic stepwise procedure optimizing between well-known quantified objectives<sup>1)</sup>. Instead we propose a decision development manifested as a reconstructed rationality<sup>2)</sup>.

## 2. CHANGE ANALYSIS - A METHODOLOGY

There do not exist many methods for change analysis or corresponding area<sup>3)</sup>. Some methods do not have a clear distinction between the analysis and decision on CIS development and the succeeding CIS development process. We present below, in an introductory way, a methodology for change analysis. This methodology has been developed in the Human-Infological research group (HUMOR).

### 2.1 Some principles

The main purpose of this methodology is to support

- a development of deep problem understanding
- a reconstruction and critical development of goals/values
- a creative development of change ideas
- a critical assessment of proposed change actions

in order to reach a rational and transparent decision development process. The method should support a stepwise elicitation and refinement

of problems, goals, etc, with a continuous development of understanding of the CA-participants. (8, 14) The method should support an authentic communication and constructive cooperation between different participants with the purpose of arriving at an intersubjectivity on problems, goals and changes.

We have so far elaborated what can be called an ideal change analysis situation. One must notice that such a situation is hard to establish even if there exists a proper method as a support and other facilitating conditions. We have, however, found it important to outline this kind of ideal situation, since it, in some sense, should be anticipated in every conscious CA-situation<sup>4)</sup>.

As an initial stage in organizational development CA is a fuzzy area. CA must be pre-structured in a general way, in order to increase the probability that the analysis acts taken mean a real progress of the CA work. A method gives guidelines to manage this fuzzy area in a more conscious way.

One must, however, have a *proper* balance between structured and unstructured work. Initially we are working with vague and ill-stated problems. We cannot have too much structure and formalism in this early problem formulation phase. The method must be sensitive to the essential character of a continuous process of problem elicitation and refinement. Some guidelines are possible for the creation of change ideas, but this process can, of course, not be reduced to a simple derivation of solutions from stated problems and goals.

A CA-method must be possible to use in many different situations. Therefore, this kind of method must be contingency oriented. It should be possible to adapt to different situations with respect to problem types, activity areas, scope, complexity and analysis resources. The method should be possible to use with different time-spans of the CA work; from a couple of hours discussion on problems and changes to a large "formal" pre-study of half a year or even more. It should be contingent to various degrees of experience and competence of the participants. Following this contingency principle, we must avoid a "cook-book-method" with a strictly sequential procedure. Instead the method should be more like a "tool-kit" with analysis areas and tasks which can be combined in different ways.

In order to enhance participation and involvement of different interest parties ("user groups") the method must be simple to learn and use. The CA work supported by the method, should in a natural way include the production of meaningful documentation. Analysis, communication and documentation should be an integrated process. The result of the CA process should be proper objectives and delimitations for the succeeding work, which might be (but does not need to be) CIS de-



velopment.

## 2.2 Methodological structure

The change analysis methodology, developed in the HUMOR group, consists of the analysis areas: Problem analysis, goal analysis, activity analysis, change requirement analysis and change action determination. (9, 8, 14) Each analysis area consists of a number of tasks. Within every analysis area the work focuses on some specific questions and on some specific knowledge acquisition. A proper CA-work means often a number of iterations between the different analysis areas and tasks. Some final order between the different analysis areas and tasks can therefore not be given. It is not even desirable to give a final order as the free order is a question of the possibility to utilize the contingency approach. However, we can still give a main structure of the relations between the different analysis areas (fig 1).

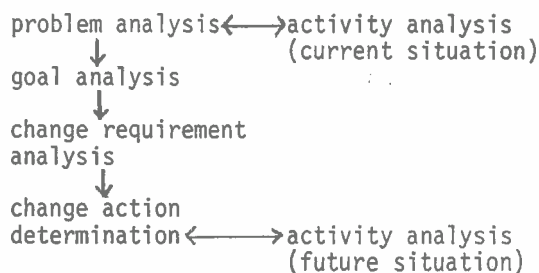


Figure 1. Principal relations between different analysis areas.

The work during the problem analysis starts from the different problematic situations in the organization. The activity analysis is aimed at supporting the problem comprehension by analysis of different aspects of the activity in the organization. During the goal analysis one clarifies the goals in order to understand the problems and to be aware of the desirable situations in the organization. After acquiring knowledge of the problems and the goals, one can evaluate the problematic situations and state the need for changes; this is worked out during the change requirement analysis. Different change actions can then be generated during the change action determination. By the activity analysis one tries to predict the effects/consequences of the different change actions in the organization.

The CA-work is supposed to be documented during the CA-process. This documentation can be used as a visible representation of motives and postulates enhancing a transparent and rational decision process. The work with the documentation during the CA is supported by documentation techniques and rules.

Below a brief description of each analysis area and the tasks follows:

Problem analysis means a stepwise elicitation

and refinement of problem conceptions and the connections between different problem situations. (14) In the initial phase of the CA-work, it is important to make a delimitation of the problem area. This first delimitation is often based upon intuitive conceptions of problems that are supposed to be important. Although, an explicit delimitation of the problem area is important, in order to clarify the expectations of the CA-work and in order to get an early stage involvement of appropriate CA-participants. The work with the identification and formulation of problems is based on situations, which are comprehended as problematic in some sense by some people. It is often necessary to discuss and reformulate the initial problem conceptions in order to get less complex and more comprehensible problem statements. This process also supports a deeper and common problem understanding among the CA-participants. If the result of the identification and formulation process is a lot of quite different statements, it is convenient to make a partitioning of the problem area and the problems into relevant sub problem areas. This partitioning also makes it possible to consider a further delimitation of the problem area for the continued CA-work. In order to get an understanding of the factors, which influence the different problem situations, it is important to perform an analysis of problem relations. The problem relations express in what way the different problems are connected. The connections can be regarded as problem causes vs problem effects.

The work during the problem analysis is often based upon implicit comprehension of different goals/values. In order to get a transparent and reliable evaluation of problems and a determination of change requirements and actions it is important to clarify the goals which are related to the problem area. The goals/values express partly why a situation is comprehended as a problematic situation and partly the desirable situation one is trying to reach by performing some kind of change action. The work during the goal analysis focuses on making relevant goals explicit. This process means a reconstruction of existing goals/values and a development of new relevant goals/values. Existing goals and values are reconstructed and made explicit during the identification of goals. Identified goals can be of different types e.g. policies, activity goals, activity rules. The goals can be institutionalized and legitimated to various degrees. They can exist as official and documented objectives or only implicit. A critical analysis of e.g. adaptation to reality, relevance and conflicts is performed during goal evaluation. In order to support the critical analysis, it can be fruitful to analyse and express the relation between different goals. This process can result in e.g. changed values of the goals, reformulation and specification of goals, development of new goals and making the goals more official. Goals which are relevant for the further CA-work are then settled during the goal determination.

Change requirement analysis means a relating of problems to corresponding goals and an evaluation of problems in order to determine the current need for changes. The change requirement expresses the problematic situations, which should be changed, but not how the problematic situation shall be changed for getting satisfaction at the settled goals. The problems are evaluated through a consideration of the problem connections and the relations to relevant goals. Each problem can be classified as either there is a need for changing the situation or there is not a need for changes. If the judgement indicates that there is no need for changing the situation this can depend on: The goals are changed, the problem is not so important/relevant or the earlier problematic situation is already changed during the CA-work. Analysis of power and opportunities is a preparation for the creative work with different change ideas. The work during this task is focusing on positive resources within and outside the organization. The change requirements can be formulated from evaluated problems and the knowledge of power and opportunities.

The work during the analysis area change action determination focuses on different possible ways of changing in order to obtain more unproblematic situations in the organization. One and the same change requirement can be provided in several ways. And the intention is to choose the combination of change actions, which can be estimated as the best change/solution for the organization. Creation of change actions is performed for every change requirement. One requirement/problem can call for several change actions and one change action can change/solve several problems/requirements. In order to investigate different possibilities for changes, a creation of alternative change actions is very urgent. The change actions are evaluated in order to estimate the effects/consequences of the change actions in the organization. The evaluation is done both from an economic and noneconomic point of view. Different prerequisites and obstacles for a successful accomplishment of the change actions are identified. The choice of change actions is then based on the holistic evaluation. The choice is a proposal which expresses the combination of change actions, which are estimated to improve the initial problematic situations. The choice also expresses important and critical factors of the judgement.

The activity analysis is intended to, mainly, support the work during the problem analysis and the change action determination. The purpose is to aid a deeper understanding of problems and change actions. The activity analysis means studies of different aspects of the activity in the organization in relation to the problems or the change actions. Different tasks can be performed as analysis of activity structure, activity relating, analysis of work operations, analysis of work responsibility and analysis of activity principles. The direction and the proportion of

the activity analysis are completely depending on the need of a deeper knowledge and understanding of problems and change actions.

The result from the different tasks is continuously recorded in different types of document/descriptions,(9) eg the problem relations are documented in Problem-graphs, the goal relations in Goal-graphs the activity relation in Activity-graphs (8, 11) and the consequences of the change actions in Effect-documents.

### 3. USE AND TEST OF THE METHODOLOGY

The value of a method lies in the results arrived at using the method. The inquiry problem is how to study and gain experiences from method use. Different test situations can be distinguished.(15) One can have a laboratory setting, where different parts and aspects of the method can be studied. In such a setting it is possible to use both made up cases and real cases (done once again). It is also possible to study the method in a real-life setting.

What does it mean to study the quality of a method? A method is a prescription for human action. (7) It is not an aid for a physical instrumental action. It is an aid for action aiming at development of understanding. (12) A method should improve problem solving, knowledge development, communication and social interaction. As investigators, our knowledge interest (12) must be of praxis character (6) aiming at social meanings of action and understanding. Our method studies cannot be governed by a technical knowledge interest aiming at getting control over parts of nature, in order to manipulate it. A method (in the area of change analysis) is not a physical tool, and we are not studying how well a tool fits to a physical environment. We should not use a test situation strictly imitating natural science laboratory experiments. Instead we should use an inquiry situation, which permits closeness to investigated phenomena and with possibilities to see meaning relationships rather than causal relationships. It must be possible to reconstruct flaws and effectiveness of the method. We must arrange for interpretation and reconstruction.

The arguments above points at mainly using real life cases for method tests. This has been done in our research. We have studied the method in use in some real change analysis projects. Scientifically we have used a multi-methodological approach with a combination of different empirical observation methods as participant observation, interviewing and document collecting. (15)

The method has been used in different kinds of change analysis applications. Some of them are listed below:

- Changes in an accounting system due to organizational decentralization (airline company)

- Administration and distribution of large paper rolls (paper producing company).
- Regional development of transportation and container management (several industries and transportation companies).

Some important experiences from method use are:

- Problem analysis (with problem graphs) is very powerful to reach an understanding of different problematic situations.
- The role of the analyst is very important for getting the participants ("users") to take an active part in the CA-work.
- People are usually not accustomed to participate in a presuppositionless problem analysis. It takes time to escape from a solution oriented work.
- The methodology must be implemented in a CA-situation well integrated with adequate forms of cooperation.
- The descriptions of problems, goals and change requirements form a good basis and frame for a creative development of change proposals.

#### FOOTNOTES:

- 1) Confer critique in (5, 13)
- 2) This follows critical social theory (10, 12)
- 3) Bemelmans and Eloranta (3) motivate the importance of this area. They make a survey of different methods but notice the low amount of methods. Cf also (1).
- 4) Confer Habermas' argumentation (10, 12) that aspects of ideal communication are anticipated in normal communication and discourse.

#### REFERENCES:

- (1) Argelo, S.M., Pitfalls in automation projects, in (2) (1984).
- (2) Bemelmans, T., Beyond productivity: Information systems development for organizational effectiveness, North-Holland, Amsterdam (Ed, 1984).
- (3) Bemelmans, T. and Eloranta, E, On systematic design of information systems in (2), (1984).
- (4) Berger, P.L. and Luckmann, T., The social construction of reality, Doubleday & Co, Garden City, N.Y. (1967).
- (5) Ciborra, C.V., Management information systems: A contractual view in (2) (1984).
- (6) Freire, D., Pedagogy of the oppressed, Herder and Herder, New York (1970).
- (7) Goldkuhl, G., Human-infological research - framework and strategy, IFIP 8.2 work group meeting 'Frameworks, methods, tools and procedures for user-oriented information systems design, Copenhagen, 1982.
- (8) Goldkuhl, G. and Lyttinen, K., Information systems specification as rule reconstruction. in (2). Minneapolis, Aug 22-24, 1983.
- (9) Goldkuhl, G. and Röstlinger, A., Förändringsanalys enligt SIM - från problem till förändringsåtgärder, HUMOR, Chalmers Univ of Technology, Göteborg (in Swedish) (1983).
- (10) Habermas, J., Communication and the evolution of society, Heinemann, London (1979).
- (11) Lundeborg, M., Goldkuhl, G., Nilsson, A., Information systems development - a systematic approach, Prentice-Hall, Englewood Cliffs, (1981).
- (12) McCarthy, T., The critical theory of Jürgen Habermas, MIT Press, Cambridge, Mass (1978).
- (13) Mintzberg, H., Beyond implementation. An analysis of the resistance to policy analysis. IFORS Conference, Toronto, (1978).
- (14) Röstlinger, A., Problem analysis - a methodological outline, in Goldkuhl, G., Kall, C-O., (Eds, 1982) Report from the fifth Scandinavian Research Seminar on Systemeering, Dept of Information Processing, Chalmers Univ of Technology, Göteborg (1982).
- (15) Röstlinger, A. and Selldén, J., How to perform an empirical study on a change analysis method, 6th Scandinavian Research Seminar on Systemeering, Univ of Bergen (1983).