Information Systems Assessment as a Learning Process

Preben Etzerodt
Kim Halskov Madsen

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Preben Etzerodt

Sygehus-datacentret

Kommunedata Aarhus

Denmark

Kim Halskov Madsen

Information Science Department

Aarhus University

Denmark

(email: halskov@daimi.dk)

Abstract

In this paper we emphasize the cognitive and learning aspects of information systems assessment. In doing so we step away from what we consider as the conventional framework. We elucidate the cognitive and learning aspects by presenting a specific project on information systems assessment. In this project, the basic means for fostering a learning process among the participants have been: working groups, focussing on experiences gained by individuals using the information system, using unstructured descriptions to clarify and interpret situations and using specific techniques to uncover and contrast different framings of situations in the organization.

1 Introduction

Information systems assessment activities are certainly not new within the field of systems development, (see for instance [1]). But it is only recently that the literature on systems development has generally recommended formal procedures for information systems assessment, (see for instance [2], [3], [4], [5] and [6]). In the prevalent tradition, different techniques for gathering and processing information concerning the performance of the system and the organization are proposed with the purpose of determining whether the new or changed system has met its objectives. The collected information is seen as an important basis for the subsequent maintenance or adjustment of the system.

The acknowledgment of assessment as an important part of the life cycle of an information system is, on the one hand, valuable progress. But, on the other hand, it is regrettable that assessment has been based on the same set of assumptions over the years. The general wisdom has been dominated by a very narrow understanding of success or failure of an information system: e.g. "The most fundamental concern during postimplementation review is determining whether the system has met its objective. That is, analysts want to know if the performance level of users is improved and the system is producing the result intended. If either is not, one may question whether the system can be considered successful", [5]. Determining the success or failure of an information system has, in general, been seen as a matter of measuring the gap between the stated goals and the actual performance of the system, e.g. "Therefore, the primary objective of an evaluation of a system is to determine the extent to which the system and/or proposed changes to it fulfill the goal statement", [4]. In the more extreme cases much effort has been put into the development of sophisticated mathematical techniques for transforming non monetary values, e.g. user confidence, into monetary values in order to set the costs against the benefits of the information system.

We do not deny the need of organizations to control the costs and benefits of major investments such as computer systems. But our point is that the conventional techniques for objective measurement of a fixed set of system values tend to obscure the valuable experiences of the members of the organization. The insight gained by the actors involved in the development and use of the system - be they users, managers or computer professionals - is in general not given great importance and hence often lost. The crucial point is that this knowledge could be a basis for a better utilization of the resources spent on the development of the system, which is far beyond what the conventional techniques can offer. If this knowledge is brought to the surface it would help the actors in improving their understanding of the situation in which they are involved, and ultimately it would improve the ability of the actors to identify and solve problems emerging as a consequence of the information system in the organization. Our point of view on this issue is very much in accordance with the findings of the MARS project, a Danish research project on systems development in practice, (see for instance [7]).

The considerations above indicate our intention in this paper. We emphasize the cognitive and learning aspects of information systems assessment, to some extent leaving other aspects in the background. Information system evaluation should be seen as a process

where the actors involved learn from their own experiences, and not just as a process of measuring a fixed set of system values.

We draw on experiences from a two year information systems assessment project at the Danish university libraries. The project has been driven by the notion of information system assessment seen as a learning process, and it has aimed to foster a process where the employees are given the skill and knowledge necessary for assessing present information systems as well as visions of future computer applications. The project has been organized around working groups at three selected libraries, where employees from the library work together with external consultants. In the following, we draw on experiences from one of the working groups by referring to specific examples and situations. The working group in question is located at one of the major Danish university libraries that has used computers intensively over several years.

Each of the following four sections covers a different aspect of the library project: the organization of the project, the focus of attention within the project, the basic tools and the basic techniques. As a way of presenting the charateristics of ISA (Information Systems Assessment) as a learning process we often contrast with what we call "the conventional framework of ISA". To clarify our message, we draw, from time to time, a somewhat simplified picture of "the conventional framework of ISA".

2   Organization

Within the conventional framework of ISA the subject-matter is approached from outside. The assessment activities are carried out by a small group of experts detached from the development of the system as well as detached from its daily use. Usually the group is made up of experts in assessment associated with the computer department or of external consultants. In some cases, it is recommended that the users take part in the assessment, but it is important that the persons involved have an objective perception of the system, e.g. "A disinterested party is best, because this person has no preconceived notion or vested interests" [2]. As the result of the assessment, the experts are supposed to deliver a document containing their judgment and measurements of the system and its performance.

The assessment activities within the library project have been organized in accordance with our notion of ISA as a learning process. The assessment activities have been carried out from the inside, in the sense that external consultants have been engaged with the purpose of supporting the members of the organization in assessing the information systems used at their work-place. It has been the intention that exactly those members of the organization who have interests in the information system should be engaged in the assessment.

When the library in question was chosen as one of the participating libraries, a working group was established. The working group is made up of a sociologist, a computer scientist and six members of the staff. The work within the group has been organized around group meetings approximately every third week. Except for an overall coordination with similar working groups established at the two other participating libraries, the group has been in

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control of its own work and only responsible to the library in question, i.e. the existing committees at the library made up of representatives from the staff and the management.

One of the first experiences - which we actually had taken into account but underestimated in the overall planning of the project - was that the conditions for carrying out assessment from the inside were not present beforehand. These conditions had to be created before any assessment activities could be undertaken. The essential issue was that the members of the group had very different backgrounds. Besides the two consultants coming from outside, the group was made up of clerical workers and librarians. Almost every department had a representative.

The first three months were spent establishing the local part of the project at the library in question. During that time the working group reached a consensus on the domain to be investigated and on what the group was aiming at. Moreover, a common understanding of the conditions that the group was working under was reached:

The group intended to start out by uncovering the impacts of the circulation control system on the conditions of work as well as its impact on the work in general. Moreover the intention was to uncover possible domains of actions, i.e. clarifying desirable and realistic changes and ways of achieving them. On the other hand, the group realized that it did not have the resources to intervene radically into the existing development and use of computers, for instance, by creating alternative designs. The present computer system, long term contracts, the existing power structure were conditions or obstacles impossible to overcome immediately.

During the following assessment activities undertaken by the working group, the outside consultants played various roles: They supported the group members coming from the library in uncovering and highlighting problems concerning the use of the computers. They played different roles such as that of "experts" having a theoretical background in computer science and in sociology; as advisers having experiences with similar kinds of co-operation with users; and as critics having their own opinion about the situation at the library.

As we shall describe in greater detail in the following sections, the investigations made by the working group often had the following course of action: Most of the investigations were not planned in detail in advance. The motivation for doing the specific investigation often emerged from the insight gained by previous investigations. At such occasions, it was the task of the consultants to choose and present appropriate methods for carrying out the investigation. After the group members had decided to use a particular method, the group often planned a pilot project where the group members tried out the method, for instance, by making observations during their own day of work or by describing a small part of their own work. The purpose of performing these pilot projects was mainly to make the group familiar with the method. Afterwards, when the investigation was carried out in full scale, some of the group members from the library often had the responsibility for carrying out the investigation, while the consultants played the role of advisers or critics.

It is important to notice that the group members from the library (i.e. the staff) could

not have carried out the assessment activities completely on their own. They needed the help from the outside consultants and their theoretical and practical background. But, on the other hand, it is important to stress that the staff had the decisive word on which activities should constitute the assessment at their own place of work. Moreover the staff performed the assessments.

3 Focus of attention

Within the conventional framework of ISA, the technical-oriented "bird's eye view" of computer based systems is used. The organization is seen from above and focus of attention is primarily on system performance and on information- and dataprocessing capacity of the organizational unit using the information system, e.g. "The concerns raised during analysis and design about the accuracy of information, timeliness of presentation, completeness, and appropriateness of format continue to indicate systems quality" [5]. The main concern is to determine to what extent the system fulfills the technical and economic goals stated at the beginning of its development.

Within the library project, the use of the information system has basically been considered from the point of view of the individuals using the system. Various aspects of how the use of computers influence the situation of work for the individual as well as the organization as a whole have been considered. Focus of attention has especially been put on how individuals perceive their own situation of work. The intention has been to uncover individual points of view on what constitute the problems concerning the use of the information system. As an example, let us consider the following course of action within the library project:

The early investigations of the project, one of which we will return to in section 4, had uncovered certain changes in the way various tasks were done after the installation of the circulation control system, e.g. changes in the technology and in the organization of the work.

Though a consensus was reached about these issues, it was not at all a trivial task to agree on the impacts of these changes on the work situation, e.g. the kind of problems and uncertainty faced in the daily situation of work and the service offered by the department.

It was clear that the question of judging the above mentioned changes, to a large extent was a question about which values and views were brought to the situation. For instance, the quality of service could be seen as a matter of "time taken to get hold of a book" or "that there should always be someone to guide and help the borrowers".

On an earlier occasion the working group had planned to complement the previous investigations with interviews of the different groups of users with the purpose of revealing different perceptions of how the computer system had affected the daily work situation. The importance of these interviews was strengthened by discussions within the group about how to interpret the uncovered changes in the work.

From the knowledge gained so far, the group prepared a number of themes and more

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detailed questions to guide the interviews. In accordance with the overall aim of the local project, the group members agreed that it was important during the interview session to put emphasis on problems faced during work and causes or explanations that the workers could give to these problems.

The interview session revealed a great variety of problems and individual experiences. The following is an account of how *one* of these experiences was revealed and pursued: The majority of the people involved in the interview session concurrently expressed that the new computer system had left them in a position often not in control of "things". The problems were, of course, expressed differently by different people. One person said, that the computer system had made her dependent on younger colleagues who knew the system better. Another said, that she did not feel the same control over the tools as when she was working with the manual card index. Others expressed that they felt a lack of qualification to fulfill their job, and some pointed out examples where they, due to mistakes or failures, had been blamed by borrowers or colleagues. Some of the problems seemed to have become more and more important as time has gone by. There was an expectation that everybody would get used to the new routines, but what happened instead was that everybody seemed to put more and more effort in hiding their uncertainty, first of all from the borrowers, but also from their colleagues and their leaders. When seeking causes to the problems, there was some variation in the explanations given.

Among *the staff of the department* there was some variation, but quite a lot expressed a dissatisfaction with the training programs offered before the computer system was introduced. Some pointed out, as an important cause of the problems, the very abrupt change to the new and not sufficiently tested system. For instance, when you finish a reservation by typing carriage return twice the reservation just made is lost, and sometimes you get unintelligible error messages. Moreover the computer system has very high responds time in the afternoons.

The management recognized too, that the revealed problems were present in the department. But they did not accept the given explanations, like the offered training programs etc., as reasonable causes of the problems. Instead they pointed out a very low degree of motivation among parts of the staff towards new challenges as the main cause of the problems. They stressed their opinion of the situation by examples such as: "During the last years the staff had several times been invited to join courses of different kinds. But it was always the very same few enthusiasts who actually applied".

The technicians of the edp department recognized too, that there were serious problems in the department. But they denied that the causes of the problems had anything to do with the new computer system. Though there had been some technical problems during a transitional period of time, they argued that the problems should be found elsewhere. Instead they pointed out "poor leadership" and "bad social relations" as the causes of the problem.

Evidently, the various groups of individuals had interpreted the same situation in rather different ways. The process of exploring the individual experiences has not just been a process of collecting and structuring information with the purpose of giving an account of these experiences. During the interview sessions the different explanations or interpre-

tations of the problem have been discussed. This in itself can be seen as an important contribution to a better understanding of individuals, or groups of individuals, conception of reality and how they, explicitly or implicitly, justify their actions.

During the interview session and the succeeding discussions of the working group, emphasis was consciously put on elaborating and clarifying the individual and sometimes conflicting interpretations of the impacts of the circulation control system on working conditions.

The intention was to bring to the foreground the experiences gained by the individuals using the computer system. The important point is that communicating and bringing to the foreground this kind of knowledge is essential in improving the understanding among the actors of the situation in which they are involved, and ultimately in improving the ability of the actors to identify and solve problems emerging as a consequence of the information system in the organization.

4 Basic tools

Within the conventional framework of ISA, descriptions are being used as the basic tool for documenting and making representations of the situation. Descriptions are made with the purpose of communicating the result of the assessment. The basic concepts are a fixed set of system values or categories, e.g. "Depending on the system characteristics being evaluated, a number of separate measures may be used. The most common is a monetary measurement, giving each system characteristic a price or dollar value. Other measures used in system evaluation include processing times, counts of goals served or users supported, and assignment of scores of subsystem quality", [4]. The meaning of concepts like "response time" are formally or clearly defined. Misunderstandings are considered as failures and should be avoided. No attention is paid to the use of language itself.

Within the library project, unstructured descriptions have been used as a tool for clarifying and interpreting the situation at the library. Describing has been a cognitive activity and a way for the staff to learn from their own experiences. The attention of the group members has been guided by some overall themes, e.g. "the organization of work". The meaning of concepts used in descriptions of the situation at the library has often been questioned. Misunderstandings have been seen as important and fruitful indications of relevant issues to be discussed. Special attention has been payed to the language itself.

As an example, consider the following course of action from the very first part of the project when the group had decided to uncover the impact of the circulation control system: An obvious precondition for gaining insight into the impact on the work was an understanding of what the work itself was all about. Some of the members of the group were actually working in the circulation department, but the rest of the members had only an overall understanding of the work.

As a first introduction to the circulation department, two members of the group working

in the department gave a presentation of the department. The first one, a librarian, gave a presentation of the circulation control system. She presented the history and components of the system and demonstrated the various types of dialogs on a terminal. The second one, a clerical worker, went through the tasks of the department before and after the system was introduced.

As the two persons introduced the group to their work, they often showed us what they did, or made drawings on the blackboard visualizing the scenery of the department and the changes made as the system was introduced. As they talked about their work, they did it in terms of concepts from their daily work. They used some formal terms, such as "counter duty" very often referring to physical locations and used in the official or formal planning of work. They used a lot of informal terms, such as "dispatch of batch messages" used by smaller groups in the coordination of their daily work.

The observations made above are very much in accordance with observations made by Andersen and Holmqvist [8]: It is important to note the differences between the language inside and outside the work situation. Two characteristics of the language used in the work situation are of special importance in our case: It is impossible to understand the language of the work situation without the knowledge of actions undertaken in the work situation, and the language of the work situation focuses on concrete actions that have to be done and not on results and abstract actions. For group members who were not working in the circulation department, it was often difficult to understand the presentation of their work when explained in a language similar to the one used in the work situation. Although the concepts used were meaningful and useful in the work situation, they were almost meaningless when used about the work detached from the concrete work situation.

Another kind of explanation may be given by referring to Heidegger. According to Heidegger's philosophy, the fundamental state of being is to have access to the world through practical involvement, one is acting unreflectingly without having representations of phenomena, - the situation is ready-to-hand. Object and properties are only inherent in events of breaking down in which they become present-at-hand. The point is clarified by one simple example (originally due to Heidegger, but here quoted from [9] p. 36):

> "One simple example he gives is that of a hammer being used by a person engaged in driving a nail. To the person doing the hammering, the hammer as such does not exist. It is part of the background of *readiness-to-hand* that is taken for granted without explicit recognition or identification as an object. It is part of the hammer's world, but it is not present any more than are the tendons of the hammerer's arm.
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> The hammer presents itself as a hammer only when there is some kind of breaking down or *unreadiness-to-hand*. Its hammerness emerges if it breaks or slips from grasp or mars the wood, or if there is a nail to be driven and the hammer cannot be found".

Turning back to the investigation of the circulation department, we can note that the staff do have knowledge of their own work but in a state of readiness-to-hand. In the daily work situation they do not have to talk about what they are doing, only in situations of breakdown, do objects and properties come into existence. The statement "Language

need express only what is not obvious."([9] p.74) contains the key point in one sentence.

Motivated by a need for a better understanding of the work in the circulation department we decided to make various kinds of unstructured descriptions of the work. One of the descriptions made was based on a time structure investigation aiming at documenting issues such as "the amount of time spent at terminals", "the distribution of work among the employees", "the variation in the work" etc. Although this was the major aim of the time structure investigation, the investigation turned out to contribute decisively to the establishment of a better understanding of the work.

An important part of the investigation was the identification of the functions of work in the circulation department. At a group meeting we presented a general set of categories of functions of work such as "planning functions", "control functions" etc. which we used in the generation of a set of specific functions carried out in the circulation department, - for instance, we had identified the control functions as being "control of returned books", "control of requisition forms" etc. During the group meeting, some minor modifications of the specific set of functions were made. The next step was to perform a pilot project only involving the three working group members from the circulation department. During a 3 day period the three working group members registered what they were doing in terms of the various functions. To get a detailed picture of the time structure, the three group members filled out a time schema during the working-day. The schema was made of the various functions along the rows and time periods along the columns.

During the pilot project, it became evident that the meaning of the various functions was unclear and hence had been interpreted differently by the three persons involved. It was decided to form a subgroup which should be responsible for revising the set of functions and giving a thorough explanation of their meaning. Furthermore the group was responsible for the introduction of the method to the staff in the circulation department as well as for the conduct of the investigation.

During the time structure investigation, various unstructured descriptions of the distribution of work, the time spent at the terminal etc. were made. These descriptions were, in themselves, of great value. But more importantly, the process of making the descriptions was a learning process making the individual members of the group more qualified at talking about the work in the circulation department. The ability to talk about the work on a functional level was improved, making it possible to talk about other aspects of the work, such as in which situations of work the circulation control system actually is used. Moreover the meaning of concepts like "interruption" and "variation" of the work were clarified.

Not only the descriptions made during the time structure investigation, but also other kinds of descriptions made at later stages of the library project, have been used within the group as tools to develop and bring to the foreground experiences gained by individuals in the daily use of the circulation control system. Describing has been a cognitive activity and a way for the staff to learn from their own experiences and hereby making them more qualified at discussing the impact of the circulation control system. Descriptions have reflected the knowledge of the group and made it possible to build up further knowledge.

5 Basic Techniques

Within the conventional framework of ISA, assessment is basically seen as a matter of gathering and processing information about the new or changed information system, e.g. "Evaluators will need to gather statistics and do some interviewing and observation in order to assess system functioning and user satisfaction" [2]. For this purpose various techniques are recommended, e.g. questionnaire, interview, observation, sampling, record inspection.

Within the library project, we aimed at fostering a learning process among the members of the organization using the information system. The techniques reflect the basic assumption that different people interpret reality differently. We have focused on techniques for bringing out the individual experiences concerning the use of the system, as well as techniques for clarifying the way the situation was framed, i.e. by which views and values the situation was arranged by different groups of members of the organization. The intention was, through uncovering and contrasting different and sometimes conflicting framings of the situation, to develop a better understanding. We have not intended to, nor has it been possible, to create a fully shared understanding among the different groups of members of the organization.

Seen from this point of view - i.e. viewing frames as important for how one understands phenomena, reframing becomes important as a technique for gaining a better understanding. Reframing can be considered as a matter of drawing boundaries for the domain of our attention and seeing a situation as another situation, but of course, there cannot be given any general rule for how to reframe experienced problems. Different kinds of problems need different kinds of treatment. The following is an account of how the kind of problems mentioned in the section 3 were treated.

It was obvious that the technicians saw the situation in the circulation control department from outside, feeling no responsibility for what was happening. They belonged to the newly established computer department and their only responsibility was to keep the computer running. The management saw the situation from outside too, explaining the problems as personal characteristics. They had, with no success, tried to change the situation by offering courses. They strongly believed that it would only be possible to change the situation radically when the elderly part of the staff retired. Among the staff, the situation was obviously seen from inside. But the problems were mainly seen as problems of the individuals, for instance by explaining the problems as lack of qualifications.

The working group decided to challenge the embedded frames, that were crucial for how the different parties addressed the situation and the problems in the department. The basic technique was to set up other frames and to examine the consequences of viewing the situation and the experienced problems from new points of view. The intention was to create an interpretation of the situation in the department that would include a better understanding of how the experienced problems were related to the use of the computer. The idea was to make the management and the technicians together with the staff part of the present situation in the circulation control department. Instead of seeing the problems as problems of the department, we intended to see the problems as problems in the system

development process.

Based on the experiences brought out during the interview sessions, the members of the group agreed on three themes that should be of special interest during the historical investigation:

- the communication during the development process,- especially between the persons engaged in the process and the staff at the library;

- the decision making during the development process,- especially the influence of the staff on the decisions made;

- the change made of the library during the development process,- including the introduction of the system and the offered training programs.

The historical investigation was carried out in two steps: The first step consisted of collecting and uncovering the various public as well as private notes and documents concerning the development of the system. Based on this uncovering of scattered information, formal as well as informal, the group created a first overall, but still insufficient, description of the development process. The description identified and structured important events in a time sequence and related these events to actions undertaken during the process and to conditions for the process. The description acted as a common frame of reference for the group, and as such, it was an important part of the preparations for the second step of the investigations. During the second step of the investigation the group arranged hearings of representatives from the management, the staff and the technicians who had been engaged in the development of the system. As a result of the historical investigation the members of the group wrote a working paper made up of 14 small stories about important events during the development process, structured in a chronological time sequence.

The process of reframing the experienced problems - i.e. seeing the problems of today as problems in the development process - have been fruitful in clarifying dilemmas and in gaining a better understanding of the situation in the circulation department. The stories mentioned represent groundings for other settings of the experienced problems than the ones given during the interview sessions. Instead of seeing a problem like a widespread feeling of uncertainty or lack of control among the staff primarily as a matter of personal characteristics or poor leadership, another domain of possible sources for the problems was brought to public awareness:

- the lack of information from the project group to the future users;

- the absence of possibilities for the users to influence the project before the very last part of the development process;

- the abrupt introduction of the system in the department;

- the changes to the system that were undertaken due to technical problems;

- demands that were not fulfilled.

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Bringing these possible sources of today's problems to the foreground not only created a better understanding within the group but also a greater consensus among groups of individuals in their judgment of possible and feasible domains of action. Not only the historical investigation aimed at reframing the experienced problems but so did also the other investigations made during the library project.

6 Summary

The previous sections have promoted the idea of ISA as a learning process. The basic idea is to consider ISA as a process where the members of the organization learn from their own experiences and not just as a process of measuring a fixed set of system values. We have elucidated and made the notion of ISA as a learning process concrete by presenting four different aspects of the library project.

The working group based organization has been an important precondition for ISA as a learning process. The assessment has been carried out by the members of the organization who actually use the information system. The external consultants have acted as advisors and critics.

Focus of attention has been the experiences gained by the individuals using the information system. An important point is that this kind of knowledge is very valuable not only to the specific organization or employees in question, but also to employees at other organizations and perhaps using a different information system. We believe that communicating and bringing to the foreground this kind of knowledge, is of greater value than a more general set of statements when employees in other organizations are working at influencing the use of computers.

Unstructured descriptions have consciously been used as a tool for creating awareness of the situation at the organization. The use of language for making descriptions has been a cognitive process and a way for the members of the organization to learn from their own experiences and hereby making them more qualified at assessing the information system. The language of the members of the organization has reflected their knowledge and made it possible to build up further knowledge.

The basic technique has been reframing in order to create better interpretations of the situation at the organization. Behind the idea of using different frames are the assumptions that understanding (i.e. assessing) is a matter of interpretation, and that the situation at the organization may be interpreted in more than just one way.

We have set up an alternative to conventional ISA. Although unusual, our project is not unique. Within Scandinavia a number of similar projects, e.g. DUE [10], FLORENCE [11], UTOPIA [12] have been undertaken during the last ten years. These projects have been based on a democratic view on working life: All parties involved should have the resources and the rights to influence the development and use of the information system in accordance with their own interests.

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