

A CASE FOR SOFT SYSTEMS METHODOLOGY. INFORMATION ANALYSIS AND INFORMATION SYSTEMS EVALUATION DURING ORGANIZATIONAL CHANGE

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ABSTRACT

The complex relationship between organizations, information technology (IT) and information systems (IS) indicates that changes to the organization are likely to have an effect on the usefulness of existing IS and the success of IS projects. Information needs of new and existing users have to be assessed and organizational IS evaluated for their capability to satisfy these needs. This paper describes a real world case study during which Soft Systems Methodology (SSM) was used for information analysis and IS evaluation during organizational change. The research indicates that the methodology provides a suitable framework for inquiry in a complex situation, where roles are ill-defined and political tensions are rife. The use of SSM helped the researcher make sense of the situation under consideration and provided positive, concrete outcomes for the case study organization.

1. INTRODUCTION

Information systems (IS) and information technology (IT) have become an integral and vital part of today's organizations. The impact of IS/IT on organizations has been widely acknowledged [Eason 1988, Robey, Boudreau 1999]. Research highlights the importance of the organizational context for the implementation and use of IS/IT [Orlikowski 1993, Karsten, Jones 1998]. The complex relationship between organizations and their IS indicates that changes to the organization are likely to have an effect on the usefulness of existing IS and the success of IS projects.

The following case study is part of research in progress for a Ph.D. in Information Systems. It describes the use of Soft Systems Methodology (SSM) to identify the information needs of a new IS user group that emerged as a result of organizational change and to evaluate several IS in various stages of development and operation for their suitability to satisfy these needs. The paper starts with an exploration of the relationship between IS and organizational change. An overview of SSM is provided next. The case study is introduced and the application of the methodology described. The difficulties experienced and the success of the approach are discussed. The paper concludes with suggestions for further research.

2. ORGANIZATIONAL CHANGE AND INFORMATION SYSTEMS

“Change forms the context within which we exist. Nothing stands still; not only do things change, but everything is changing all the time” [Redmill 1997 p. 70]. Organizational change continues to preoccupy managers and is extensively discussed in organizational literature [Robey 1986, Leavitt,

Bahrami 1988, Senge 1990, Oden 1999]. Change and adaptation are regarded as inevitable and vital for organizational survival [Eason 1988]. A volatile environment, increased competition and particularly IT are accepted as the main catalysts and enablers for organizational change. At the same time organizational factors influence IS project outcomes and organizational change can have an impact on IS [McKeen, Smith 1996]. The effects of organizational change on IS are, for example, discussed in relation to mergers and acquisitions [Robbins, Stylianou 1999, Rosa 1999]. The unpredictable consequences of organizational change frequently take the organization's members unawares and it is not until shortcomings are obvious that steps to reassess the IS are taken. Moreover, seemingly insignificant, incremental changes have an effect on IS project outcomes and the continued usefulness and usability of existing IS [Winklhofer 2001].

Changing business objectives or organizational restructure can result in new requirements, different users may become involved and priorities may change. Tensions during organizational change may result in a politically charged climate where resentment is rife and different stakeholders jostle for more power or aim to reaffirm the status quo. Moreover, existing communication gaps may become more noticeable. Frequently new roles are created, but ill defined, resulting in employees who feel insecure and strive to determine what tasks and responsibilities their positions entail. In such situations information analysis and IS evaluation are complex and difficult.

The goals of most of the approaches and strategies that are said to ensure IS success are built on the notion of a stable organization [Truex et al 1999]. The realization that change is inevitable has resulted in promoting IS development methods that do not rely on complete sets of specifications. However, these approaches are neither a panacea nor universally applicable. Their success depends on factors such as good requirements elicitation and user involvement [Redmill 1997], which are difficult to achieve during organizational change. The assumptions underlying these approaches include the belief that the users are known or easily identifiable and familiar enough with their work to articulate their needs. In general the major goals of IS methodologies still include a satisfactory level of completeness of requirements and specifications and rigorous advanced planning which may be incompatible with continuous organizational change [Truex et al 1999]. Most methods of IS evaluation are linked to information satisfaction of existing users [Baroudi, Orlikowski 1988, Igarria 1993]. Above all the methods for IS development or evaluation focus on individual IS rather than on a number of IS that may already exist or be under development in the organization.

Some of the approaches and strategies that are advocated to ensure IS success, explicitly take the organizational context into account [Checkland 1989] or address issues such as changing user requirements [Boehm, Papaccio 1990]. During organizational change new user groups and their requirements are difficult to identify and cultural and political issues need to be taken into account. Analysts therefore need tools and techniques that enable them to investigate the organizational context, deal with heterogeneous groups and the often complex relationships among the various stakeholders. In addition any method should provide a holistic view of the IS environment and the various IS in operation and under development.

As organizations change their business processes strategic alignment between IS and business, which is critical for organizational success becomes increasingly difficult [Hirschheim, Sabherwal 2001]. Various schools of strategy formation exist, presenting organizations with a wide range of approaches. The Critical Success Factor (CSF) method [Rockart 1979] for example, can help identify IS that need to be developed and reflects the perspective of senior executives. Porter's [1985] Value Chain Analysis provides a study of activities that are critical for the organization, while the Stages of Growth theory [Nolan 1974] helps managers understand where the organization is in terms of technology use and becomes the basis for determining appropriate actions. Numerous other methods for systems planning and information analysis exist, which can be classified according to their major focus [Wilson 1990]. All methods have advantages and disadvantages and personal preference and the particular situation will to a great extent determine which one is appropriate. However, most approaches focus on the perspective of a particular group such as senior executives, others provide a general overview and some help with detailed information analysis. None of the approaches seems particularly well suited to

situations where the problem itself still needs to be defined, detailed information requirements are an expected outcome and at the same time a high-level overview of IS is necessary. Moreover, these approaches do not allow the analyst to deal simultaneously with the needs of various organizational groups and different management levels. One approach that seems to be suitable for addressing the demands of such a situation is Soft Systems Methodology (SSM).

3. SOFT SYSTEMS METHODOLOGY (SSM)

SSM was conceived as a framework for the inquiry into ill-structured situations. It "...provides a general set of concepts and an intellectual framework for articulating the search for 'images of reality' which are relevant to taking purposeful action within some problem situation" [Ledington 1992 p. 18]. Checkland's 7-stage model progresses from finding out about a situation to taking action to improve it. During stages 1 and 2 the problem is still unstructured and expressed by the participants in a rich picture. Stages 3 and 4 involve systems thinking. Root definitions and conceptual models of possibly relevant systems are developed. The remaining stages are again set in the real world where action can take place. During stage 5 the ideal conceptual model is used to find similarities and differences with the perceived real world model. Stage 6 involves recommendations for culturally feasible changes and stage 7 requires the implementation of the changes agreed to during the previous stage. These 7 stages are part of the logic-based stream of inquiry and provide a functional analysis of the problem situation.

While logic plays an important part a second, 'cultural' stream of inquiry needs to be considered. The two streams interact with and inform each other. The cultural stream consists of three examinations of the problem situation: analysis of intervention, cultural and political systems analysis. The analysis of intervention deals with the different roles of the participants. In the social or cultural analysis roles, norms and values are determined. Finally, in the political systems analysis the political dimensions of the situation are explored. "Overall, the aim of SSM is to take seriously the subjectivity which is the crucial characteristic of human affairs and to treat this subjectivity, if not exactly scientifically, at least in a way characterized by intellectual rigor" [Checkland, Scholes 1990 p. 30]. The concept of 'Weltanschauung' is central to SSM. It enables the analyst and the participants to understand different perspectives on the situation. "...the problem is 'solved' through learning rather than through replacement of the current situation with an espoused improved ideal" [Davies, Ledington 1988 p. 31]. SSM uses models to structure a debate in which different conflicting objectives, needs, purposes, interests, values can be teased out and discussed [Checkland 1989].

SSM often precedes a more structured approach to IS development [Downs et al 1988, Avison, Wood-Harper 1991]. The problems of moving from SSM to a structured methodology and increasing acceptance that IS development may be the next step in the inquiry have resulted in variations on Checkland's original 7-step model. Numerous researchers have modified and tried to clarify SSM [Wilson 1990, Ledington, Ledington 1994, Ledington, Ledington 1997, Barden, Lo 1997]. Wilson [1990] extended Checkland's approach by incorporating techniques that assist in establishing information requirements which can then be used as basis for IS design and development. Analysis as suggested by Wilson enables the analyst to define management roles in terms of their activities, define the roles and then define the particular information needs of managers based on activity analysis [Wilson 1990]. Wilson demonstrates that this approach can be applied when requirements have to be redefined after an organizational restructure. Moreover, Checkland and Holwell's [1998] research indicates that SSM can be successfully employed as a methodology for IS evaluation during organizational change. The following case study describes an experience in applying SSM to establish the information requirements of a new user group that emerged as a result of organizational restructuring and to determine the extent to which existing IS and those under development could satisfy these needs.

4. CASE STUDY

From August to November 1998 the researcher carried out a consultancy within GBR, the regional office of AIM. AIM is one of 3 divisions of a state government department comprising 6 regions that had been created in 1991 by amalgamating a large number of independent branches. GBR employs approximately 500 staff and is divided into 5 areas with each area manager responsible for 6 to 9 branches. Although there is considerable independence from AIM, decisions made at state level as well as outside influences over which neither the state organization nor the regional office have control can have a significant impact on the way in which the core business activities are carried out.

AIM had recently undergone another major restructure. Power bases shifted and the restructure left in its wake a great deal of resentment at all levels of the organization. The intent of the restructure had been to assist the organization in carrying out its mission statement more successfully. In addition it was hoped that a leaner organizational structure would allow the organization to deploy its limited resources more effectively and efficiently. Despite the completion of the restructure the organization was still in the process of change during the case study. New positions were created, existing ones abolished and roles and responsibilities redefined.

As a result of the latest restructure area managers were accountable for the operations of the branches under their control. Management information that would support decision making and that helped managers in the day-to-day running of the branches was therefore critical. The researcher's task was to identify the information needs of operational management within GBR, to investigate the current regional and state information systems for their capability to satisfy these needs and to propose strategies to overcome any deficiencies.

More than 60 unstructured and semi-structured interviews with both AIM and GBR staff at all levels were conducted. Staff interviewed included indirect users such as regional managers, IS developers and managers, direct users and user managers such as regional and state support staff, and operational staff. Several issues emerged during the case study, which had a direct impact on the information needs of the different groups and the selection of the methodology for their identification. These included role ambiguity and the need for improved cross-functional communication.

For several years AIM had tried to unify a large number of independent local branches into one cohesive organization. The restructure was designed to increase efficiency and effectiveness by pushing responsibility to the regions. However, while decentralization of some functions was considered desirable, others were to remain firmly under the control of AIM. Within GBR area and branch managers were more accountable, however, they were still unsure of their roles and responsibilities and were not given the necessary autonomy to carry out their tasks effectively. As a consequence of the ambivalent attitude towards the organizational restructure GBR managers were unsure of their roles and responsibilities and their information needs.

There was considerable confusion as to who should be included into the group of operational managers. The managers' own perceptions of their roles differed between individuals and from that of top management. The regional director, the sponsor for the consultancy, clearly indicated that area managers' tasks were operational. During an interview one area manager stated that he considered his position as a strategic one and expressed resentment at having to carry out duties that related to the day-to-day running of the different branches in his area. The other area managers were still unsure of their exact roles and therefore vague in their response. This confusion can at least in part be explained by overlapping hierarchies within the organization. Strategic management of AIM included the regional director, but excluded the area managers. Within the region, however, the responsibilities of area managers appeared to be both strategic and operational.

Most regional managers were unaware which IS existed, what information they could provide and whom to approach for help. Their previous positions determined to a great extent their ability to elicit information from support staff since this depended on the managers' past ability to build up informal

communication channels. Only one of the area managers had been involved in the design of an IS and was familiar with its data. Functional managers saw it as their prerogative to access information for example on staff availability and seemed prepared to share information with area and branch managers only on a strictly “need to know” basis. The increased accountability and resulting quest for information was particularly by one functional manager perceived as a threat to his position. Some branch managers relied on area managers for essential data, while others circumvented the chain of command. All area managers received regular reports from several IS, but were unsure of their relevance. While management information was available, interviews indicated that many of the reports were considered inadequate and difficult to understand. Cost overruns were a major concern for the RED, putting area and branch managers under pressure to control and monitor expenditure. Several area managers also wanted to compare the performance of branches and to analyze trends. A small number of managers were aware that AIM and GBR had introduced an Executive Information System (EIS). However, they had never received training in its use, were unsure of its usefulness and unfamiliar with the data extracts that were available for analysis.

5. APPLICATION OF THE METHODOLOGY

After discussions with the regional director, branch, area and functional managers it was decided to focus the analysis on an agreed core of activities that the organization needs to perform, the tasks of area managers and on the desired information flow between the regional director, area and branch managers. A review of IS in operation and under development revealed the existence of a large number of IS. The lack of integration was a major concern and data duplication and inaccuracy common. Several IS projects were in progress at AIM and within the region.

Many GBR managers were new to their positions or only acting on higher duties. Most were therefore unable to specify their information requirements or to ask appropriate questions of support staff. Support staff on the other hand was unsure what information was important to managers. Different sections such as human resources and finance acted independently of each other and communicated rarely. The fragmentation of the information flow, the confusion concerning roles and responsibilities and the diversity of the management group made it difficult to establish the information requirements of the managers. Several tentative areas of information needs could, however, be identified during the interviews. But the researcher was struggling to confirm these, to determine the details and also felt the need for a more “objective justification” of any ideas that were arrived at intuitively.

It is one of the characteristics of most IS project that a situation gradually unfolds. It was not until well into the case study that the major groups and players and their influence had been identified and an overview of the IS gained. Interviews and IS review were carried out simultaneously. The researcher’s prior knowledge of SSM, the need to make sense of a new and complex situation and the inadequacy of structured approaches to deal with such a situation suggested the use of SSM very early in the case study. In addition the use of the method was also motivated by the fact that the consultancy provided for the researcher a unique opportunity to experience SSM in a ‘real world’ situation. Even before any attempt was made to apply the methodology and its techniques, SSM became the framework for inquiry. This enhanced the awareness of the political aspects, the organizational culture, the appreciation of the various perspectives of groups and individuals and the realization of the need for a holistic approach to the problem under investigation. Rather than applying SSM as a step-by-step methodology, different situations suggested the use of various techniques. However, these still followed naturally the general outline of the approach. The use of an ‘internalized’ version of the methodology as a set of guidelines rather than a method that needs to be strictly adhered to, has been advocated particularly in the case of SSM [Checkland, Holwell 1998].

In order to clarify the situation under consideration and the relationships between groups and individuals the researcher developed a rich picture. As a result of the politically sensitive nature of the situation it was decided not to discuss it with any members of the organization. Due to the geographic distances involved and the limited time available it was not possible to conduct the analysis in a group

situation. The researcher developed several CATWOEs, root definitions and conceptual models for possibly relevant systems. Wilson's activity analysis was chosen in order to achieve results that could be translated into IS requirements. In a group session with 4 of the 5 area managers the researcher provided an overview of the methodology and explained the use of CATWOE, root definition and conceptual model. During this session the preliminary analysis was discussed and amended until a relevant system was identified. A provisional activity analysis was developed during the meeting and consensus on the tasks and information needs achieved.

The organization's mission statement was used as basis for the final root definition and the conceptual model. From this the activity analysis was derived. Activities are initiated at the communication center where calls for service are received. The resulting operational activities fall into two broad categories: service and resource management. These categories overlap to some extent. The service aspect involves the assignment of timely, adequate and appropriate resources for a case, providing quality service and monitoring its effectiveness. Resource management involves the effective management of staff, equipment and vehicles and monitoring resource use and availability. Strategic management is responsible for anticipating any future resource requirements.

In order to ensure that the service is provided effectively, operational managers need information concerning the current level of experience of staff, information on the type of service and equipment required. Therefore they need access to feedback from the public and service providers, knowledge of the outcomes of service audits, information on the type of service that was administered during cases and the equipment used. Data concerning the timeliness of the response is also critical for monitoring the quality of service. The resources of the organization and the region are finite and the effective and efficient deployment of resources is critical. To achieve this managers need information about the availability of staff, equipment and vehicles and the cost of providing the service.

The result of the analysis demonstrated that area managers were responsible for strategic as well as operational objectives. The activity analysis became a means for the researcher to pull the various information sources together and to provide a rationale for the recommendations. Based on this the organization's IS in operation and under development were re-assessed to determine how and if the information could be provided. The researcher specified a number of reports for the different systems and submitted the list to the area managers for review. At the completion of the consultancy the researcher prepared a report for the regional director that included recommendations for improved access to the EIS, the generation of reports and highlighted areas where insufficient management information was available. SSM proved to be a useful method for information analysis and IS evaluation during organizational change. It helped the researcher to gain an appreciation of the organizational context, its politics and culture, the roles of the staff and the tasks that had to be performed. Most importantly the project participants found it and the results it produced useful. However, the application of the methodology was not without problems.

6. DISCUSSION

In a politically charged environment with multiple heterogeneous groups SSM proved a useful method for information analysis and IS evaluation. SSM also allowed the researcher to deal successfully with the differences between people's perceptions and the actual situation. Since the area managers were unfamiliar with the IS and often had had no opportunity to establish a relationship with support staff their understanding of the availability of data was often incorrect. In addition each area manager saw his role in a different way. Most gave little thought to the information flow to the branch managers. The conceptual model and the activity analysis served as basis for verification of statements made during interviews by other members of the organization and through official documents. The IS, support and development staff as well as IS reports were then used to determine the actual availability of data and the relevant IS.

Re-interviews several months later confirmed that the area managers' access to essential data had improved. In addition the recommendation to make the EIS more widely available and to introduce relevant training was taken up. This was a positive development since area managers had become less dependent on support staff for information. However in the case of one IS still under development during the case study further delays occurred and to date critical data is still unavailable.

In hindsight it is difficult to establish whether the process of analysis or the method of analysis had the greatest impact. The process of analysis itself proved beneficial and a major step forward for the managers. Even during the case study discussions with support staff resulted in improved communication. Moreover, formulating their requirements in business terms helped all groups to discuss issues on an equal basis. Area managers felt more confident about expressing their needs and became aware that communication between all levels of the organization was critical, while support staff were more informed about the requirements of the managers. The techniques were flexible enough to be adapted to the specific context, provided a sense-making tool for the researcher and produced concrete outcomes for the participants. SSM helped the researcher to define the nature of the problem, to challenge assumptions, to examine the power structure and to establish in terms of roles what information was required for what purpose.

7. CONCLUSION

Persistent organizational change has an effect on IS development, implementation and operation. One of the major difficulties for organizations are frequent incremental changes that may be overlooked until their cumulative effect proves detrimental. Major restructuring is also often preceded and followed by minor, unpredictable changes. This necessitates a frequent re-evaluation of IS and possibly new user groups who have not been involved in the original project. Traditional methods of needs analysis and IS evaluation are in such situations inadequate. Re-evaluation and reassessment of IS is not only a necessity during major organizational change, but should be carried out in regular intervals and become an ongoing process. Approaches such as SSM, geared to take the political undercurrents, organizational culture and multiple stakeholders into account may prove invaluable to organizations that need to constantly adapt to their environment.

Even if regular IS evaluation occurs several fundamental problems still need to be resolved. It may be for example difficult to determine the priorities for required IS changes. In addition the next iteration of the process could produce different results. One of the major problems AIM and GBR faced was the proliferation of disparate IS. No single person was familiar with all systems and new projects. Both IS and business managers within the organization were aware of the problem. The case study illustrates that without a person who is familiar with the organizational IS, aware of current projects and who can communicate with all groups a successful outcome of the analysis unlikely. Organizations should therefore create the role of IS coordinator, since in order to carry out the analysis successfully extensive organizational and business knowledge is required, as well as knowledge of the numerous IS that exist and are under development in most organizations. The creation of this position was one of the major recommendations to the case study organization. Given the current climate of persistent organizational change and the central role of IS the position of the IS coordinator could become vital for organizational success.

8. LIMITATIONS OF THE STUDY AND FURTHER RESEARCH

While this case study demonstrates the potential of the approach, it has obvious limitations. SSM proved useful in a particular organizational context at a specific point in time. In order to confirm the appropriateness of the approach for information analysis and IS evaluation during organizational change the analysis should be carried out several times within the same organization at appropriate intervals. However, lengthy analysis is then inappropriate and ways to speed up the process should be explored. In addition it needs to be tested in other organizations.

The researcher also hopes to explore the possibility of using SSM as a method for monitoring the organizational context during IS projects. Since minor incremental organizational changes can affect IS project outcomes [Winklhofer 2001] this process could alert project participants to situations that may result in IS project failure.

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