

Using soft systems as a methodology for researching knowledge management problems

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ABSTRACT: There has been a growing interest in the use of Soft Systems Methodology (SSM) in helping solve information systems problems. This paper applies the SSM methodology within the context of action research in solving a knowledge management problem in a real world situation. The level of success in implementation of knowledge management initiatives is significantly dependent on the right balance of intervention and reflection on the current practices of the organisation. In this context SSM becomes a very valuable strategy for conducting practice-driven information research. A case study from the health care area is provided as an example of how SSM can be used to understand complex situations and as problem solving strategy for knowledge management.

Keywords: Action research, soft systems methodology, knowledge management, health care

INTRODUCTION

Knowledge management within organisations is a complex matter involving individuals, teams and the philosophy and politics of the organisation. Researching this subject area can be described as ‘messy’, that is, people, their worldviews and culture contribute to situations that are often not clear cut, and where prescriptive answers about what is ‘right’ may not always be appropriate. This paper explores reasons why using Soft Systems Methodology (SSM) may be an appropriate methodology for exploring such messy problems, and how such a methodology has been applied to a real world knowledge management problem in health care.

Knowledge management (KM) has been defined in many ways, some definitions focus on information technology and some on the culture of the organisation. For the purposes of this paper we define knowledge management as “a broad concept that addresses the full range of processes by which the organisation deploys knowledge. These involve the acquisition, distribution and use of knowledge in the organisation.”

One of the underlying themes in any definition is that of utilising the intellectual capital of the organisation. Knowledge can be classified as explicit, that has been formalised in some way, such as through the written word. Such knowledge can be considered codified. The more elusive knowledge is that which is tacit, which is stored in people’s heads, where interpretation and meaning are added.

SSM AS A METHODOLOGY

Action research is a broad research framework that encompasses a range of research methods. Action research can be defined as

“a cognitive process that depends on social interaction between the observers and those in their surroundings”
(Baskerville and Wood-Harper, 1998).

This definition includes a range of techniques used in the investigation of information systems. Different forms of action research have different models, structures and sets of goals. The essential components of any action research are viewed as a two-stage process, the diagnostic stage that analyses the social situation, and then the therapeutic stage involving change. In this stage change is introduced and the impact or outcomes are examined (Blum, 1955) Within this research paradigm, Soft Systems Methodology (SSM) is a methodology that explores the notion of ‘purposeful human activity’. SSM not only enhances our knowledge of the problem and situation but comes up with the on a useful intervention for such situations. The action research tradition recognises that the priority is one of reaching practical solutions to the problem at hand instead of only testing and generating theory (Susman and Evered, 1978)

Checkland’s SSM methodology (Checkland, 1981) lies firmly within the tradition of action research which

‘aims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework’
(Rapport, 1970)

The philosophical underpinnings of this methodology are essentially interpretative (Susman, 1978). Checkland highlights that this is important for the socio-human systems studies, because unlike the other sciences, 'human beings can always attach different meanings to the same social world' (Checkland, 1981)

This differs significantly from experimental methods; data collected is only relevant to the social situation being studied, and the same problem in a different setting may provide many different responses because of the nature of human interaction.

In fact using explicit definitions of the 'Weltanschauung' and Environment, the context of the study, as part of this methodology validates worldviews and affirms an interpreted view of reality. Such an interpretist approach leans towards naturalistic enquiry which takes place in the 'natural setting', where the social world is constructed by people. In this research we have sought to understand the world of knowledge management and how people operate and relate to such a concept, therefore this method of investigation was the most logical to use.

HOW SSM RELATES TO UNDERSTANDING KM

The major advantage in applying the SSM to KM research is that it includes explicit modelling of the context of the research, which is absolutely essential to when talking about *knowledge* as opposed to *information* management. Moreover, KM system implementation assumes some way of personalisation and adaptation of it to the roles and responsibilities of the user of the system. This is required at least to the extent that the system is capable of recognising the knowledge needs of the user performing a particular task. It is also assumed that such a system has 'intelligent' capabilities to identify, store and disseminate the knowledge created while the task was performed. The steps of knowledge management research project match well the typical action research cycle (Baskerville and Wood-Harper, 1996): *Diagnosing – Action Planning - Action Taking - Evaluating - Specific Learning*. Diagnosing relates to the process of knowledge audit, which is typical for any KM project. Action planning and taking requires formulating new organisational strategies of knowledge creation and sharing. Learning and reflection, as the results of the last two steps were seen as major outcomes for the participants involved. These last steps and the learning outcome, which often includes creating new knowledge, are the major focuses of KM practice.

APPLICATION TO EVIDENCE BASED HEALTH CARE

Relevance of methodology

Purposeful activity systems can be found in all areas of work, especially where the use and flow of information are important. In this paper, we apply SSM and action research to help solve knowledge management problems within the context of health care decision making. In this area of endeavour, the range of information sources available on which to make decisions grows daily, health practitioners are overwhelmed with the information explosion,

'busy clinicians are now caught in an information paradox overwhelmed with information but unable to find the knowledge they need when they need it' (Muir Gray, 1998)

Information providers can in many ways alleviate this problem situation. They can retrieve, sift and interpret information on behalf of practitioners. By doing so they are not only saving time but also transforming large amounts of information into knowledge about specific topics. This situation is one where knowledge management could be used to refine and streamline the process for information providers, saving time and resources as knowledge is captured, stored and shared in more efficient ways.

With such problems at hand, SSM helps the investigator to move beyond simply generating knowledge and theory about a situation, to solving real world problems. Finding participants for this research therefore became easy, as participants saw that they could gain both an understanding of the world around them, but also collaborate and participate in solving problems, which was relevant and meaningful to them.

Using SSM gave us a form of structured enquiry, in two streams; one where models of human activity systems are named, modelled and used to illuminate the problem, the other where perceptions of the real world are examined. Comparison of the two structures creates debate about change. Applying such enquiry to a problem in knowledge management sought to bring about changes in real world of information providers. This rather logical stream of enquiry embraced the cultural, social or political aspects of the situation.

Our research was aimed at the development of a comprehensive approach to improving the work practices in a knowledge work context as well as constructing a research theory of knowledge management systems for such an environment. This goal required implementation of an action research methodology as the best approach suited for the practice-driven research in information systems (Baskerville and Wood-Harper, 1998). The project was also attempting to develop a prototype system as an illustration of the proposed information systems solution. This prototype is needed for comparative evaluation of the KM technologies for the identified tasks. This is another reason why action research was chosen as a paradigm for conducting this investigation as it is recognised as the preferred method when the research includes software development (Baskerville and Wood-Harper, 1998, Burstein and Gregor, 1999, Burstein, 2000).

All development has been conducted in a participatory and evolutionary manner, which has enabled information providers to actively participate in all aspects of the KM system design. This has ensured that the design of the system, and its content, supports the task process and is consistent with work practices. In addition, this process has also aimed to benefit from studying work practices that are outcomes of the SSM analysis.

Participants

Knowledge management within the context of evidence based health care gives the potential to improve quality of provision of evidence about what is 'best practice'. In this section we provide some preliminary results from the project that is implementing a knowledge management approach for information providers from the Southern Health Care Network. (Anderson, 1999) Participants for this research were approached after a search on the Internet was done, looking for organisations in Australia who were working in the area of evidence based practice information. All participants within the research provide a range of information to health care practitioners, who use the Centre in search of the 'evidence' about specific health interventions. A total of seven information providers from the Centre for Clinical Effectiveness agreed to participate in the study.

This specialist evidence Centre was set up and funded by the State government, to provide information about clinical effectiveness to all health practitioners within a network of 5 hospitals. The service has been running for over two years, and answers enquiries from medics, professions allied to medicine, nurses and midwives. These range in difficulty and complexity, depending on the questions and especially on the types of evidence, which can be found and used to answer the question asked.

Data Collection

Development of an integrated knowledge management system has been performed through an evolutionary process within an action research framework. The feedback from project participants has been continuously used to improve and refine the system. The initial phase of the project was conducted in order to study current information flows. This allowed us to gain an understanding of how knowledge was managed within a community that works towards providing knowledge about evidenced based health care to practitioners within a clinical environment. From this understanding a primary model for knowledge management within the context was derived. It has been iteratively refined and tested throughout the life of the project. As part of the modelling process an appropriate information technology infrastructure has been proposed to solve some of the knowledge management problems identified.

We have followed the common description of action research provided by Susman (1983), recommending the initial establishment of a client-system infrastructure or research environment. In the case of this research, the researcher was given the authority to specify actions and provide legitimacy to action will help the Centre.

A range of data collection techniques was used in this research.

- Web based diaries assisted in defining problems faced by staff within a SSM methodology.
- Data collected from these diaries was then validated through a focus group of the participants, where problems were prioritised.
- Interviews sharing the rich picture with participants and discussion of KM problems will then take place.
- Model validated through peer group at conference event.
- Model validated with participants through focus group.

A Model for Knowledge Management for Evidence Based Health Care

When developing a model to describe the process and structure of knowledge management within this context, SSM formalisms were employed. The role of SSM in as a method for information systems development has been widely debated (Checkland, 1981, Wilson, 1984; Stowell, 1994; Stowell, 1995). In this research this methodology is extended and applied to knowledge management and the design of systems to facilitate sharing of knowledge. This provided us with a way of identifying and building relevant and purposeful activity models from which the knowledge management requirements could be discussed. In this approach, as outlined by Checkland and Howell (Checkland and Howell, 1983), each point is contingent on the proceeding one:

1. Means attributed to their world by the people concerned;
2. Purposeful activity, purposeful in the light of those meanings;
3. Information (or in this case knowledge) support which is relevant to the people carrying out the activities;
4. Data structures and ways in which they could be manipulated to yield appropriate categories of information.

By conceptualising a model for knowledge management we could move some way to explaining the complex and sometimes paradoxical phenomena which exist in organisations. Using SSM for this purpose provides explicit well-established ways of modelling purposeful organisational activity.

After an explicit understanding of the activity was established a conceptual model of the system was developed. The purpose of the conceptual model is to accomplish what has been defined in the root definition, this is an account of '*what the system is*' (Checkland, 1997), while a conceptual model is an account of '*what the system must do*' in order to be the system named in the definition. The relationship between root definition and conceptual model is that of 'being' and 'doing'.

Interviews were used to gain an understanding of the process and context of information provision and human interaction. Diaries were used to record different processes and perceptions of action by the researcher and participants, implementation and impact of changes. After this, structured observation was used to test the model's implementation and workability. These steps have been followed by focus groups to collect feedback so that new cycles of the action research can start. Such groups had been testing the usability and relevance of the model for the wider evidence based practice community.

Analysis

Data collected using these techniques has been analysed using a grounded theory approach, which has resulted in building a theory about knowledge management derived from the phenomena studied (Strauss and Corbin, 1990).

Such a theory has been developed during the data collection process. This theory and testing of a construct model has been evolving as the action research cycles progresses. The theory has been tested and will be re-tested in future cycles. Conceptualisation of such a model and operationalising it on a pragmatic level has been occurring simultaneously through the application of SSM.

Data already collected has been analysed using NU.DIST where full texts of diaries, interviews and focus groups have been brought together. Themes that have emerged from such analysis have been taken back to the participants for further discussion and validation and ultimately further testing with the model as discussed.

Results: a Soft Systems Model

Participants were introduced to the concept of knowledge management, and the research problem was discussed. This research problem was initiated by the researcher, who has a background in knowledge work in evidence based practice. Participants were sought in this organisation because their main role was to collect information relating to clinical questions and translate them into knowledge relevant to the health care situation at hand. Their situation of spending much time and effort on collecting but not efficiently capturing knowledge made them the perfect participants for an action research project. The activity and information flows that took place within this context were then mapped and illustrated by developing a rich picture (Fennessy and Burstein, 1999). From such a detailed description of the problem, a model for managing knowledge by the intermediaries was developed. The focus of this model has been one of organising and sharing knowledge within the team of intermediaries for improved workflow and time saving.

As part of the process of modelling of the system, in order to articulate what is the scope and components of it, CATWOE description was produced first.

CATWOE

- **Customers:** information providers
- **Actors:** information providers
- **Transformation process:** that information is transformed into knowledge when evidence is searched, retrieved and appraised
- **Weltanschauung:** knowledge capturing, storing and sharing knowledge can facilitate more effective searching for the best available evidence
- **Owners:** information providers
- **Environmental Constraints:** Time and motivation to share knowledge, infrastructure to enable knowledge capture and sharing to take place

Using the above elements a root definition has been developed.

Root definition

A publicly owned knowledge system that manages the generation, capture and sharing of knowledge acquired during searching for the best available evidence to support clinical decision making.

This root definition expresses the core purpose of the activity system. This core activity depends upon obtaining the right evidence to answer the question, but also the skills of knowledge workers involved in the activity. The core element of such a root definition is its transformation process in which the defined input (question about what is effective) is transformed, into a defined output (the best available evidence, made relevant to the user).

The following conceptual model depicts the process of turning a request for more knowledge in the clinical area, the transactions involved and the end product for the user.

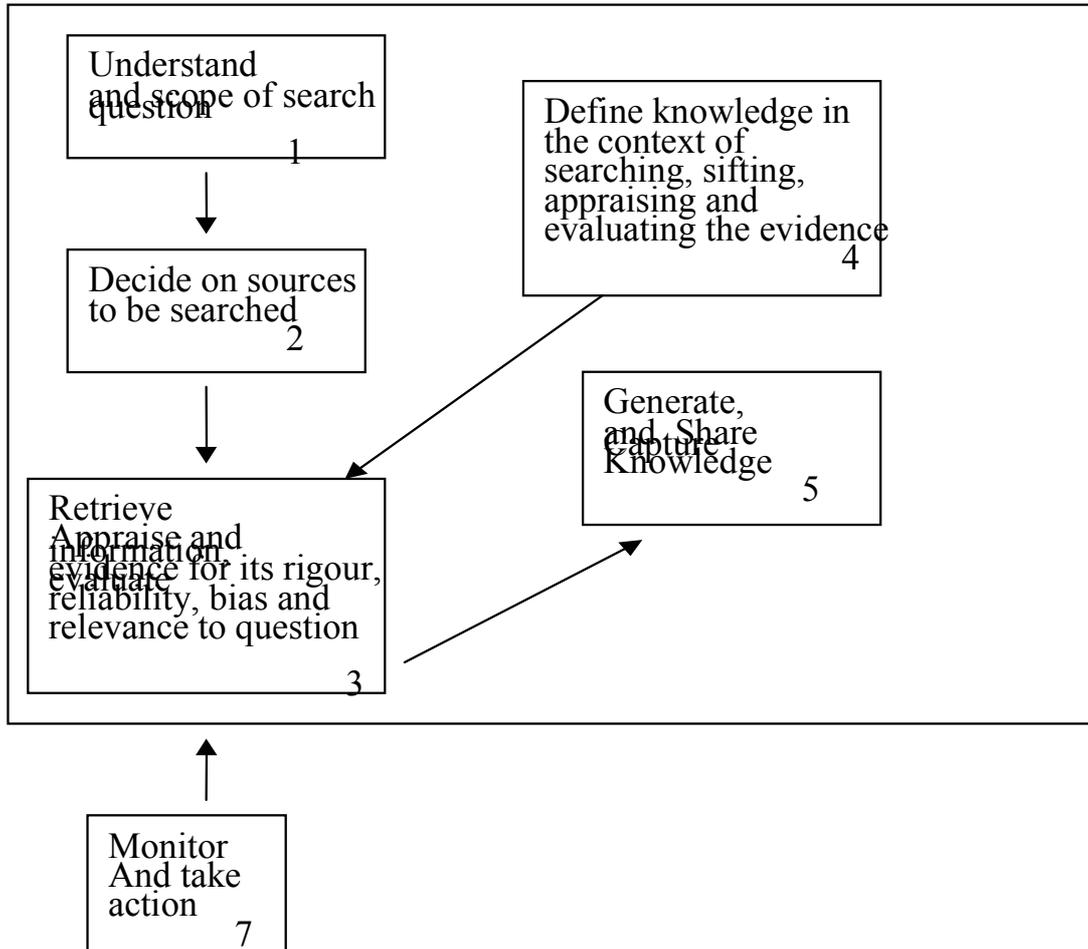


Figure 1: Conceptual model of the information providers' task

DISCUSSION

From this work we have found that knowledge generated within the system is both factual, that is new knowledge gained regarding clinical information, but more importantly meta-knowledge. Such knowledge about how to find and process knowledge for the end user is what makes the information provider's task quicker and easier in the future. Each task requires the actor to undertake a range of knowledge processes including reflection, exploration and learning. In this task-based approach to knowledge management work related processes contribute to the ongoing building of organisational memory; which reflects experience, and knowledge of the task (Fennessy and Burstein 2000). Such a complex task is influenced by past experience with the task of transforming questions for evidence into action. The information provider takes the problem to develop their understanding not only relevant to this context, but takes the 'knowledge' that has been gained from this encounter, to inform further encounters with other practitioners.

This differs vastly from the traditional aspirations of evidence based health care as a method for the end user to search for their own information and then transform it into knowledge on an *ad hoc* basis. Applying SSM in this project has helped us to establish that such an approach is an inefficient way of transforming information into knowledge. Clinicians will rarely gain enough exposure to this process in their professional lives to develop a building of memory on meta-knowledge, an essential prerequisite for successful discovery of the best available evidence for decision making. Further stages of this project will be related to the introduction of the technological solution into the knowledge management approach.

CONCLUSION

From the case study we can see that SSM has been a way to explore and discuss problems relating to knowledge management in a complex situation. This methodology offers a flexible approach, where solutions to problems can be tested and re-tested with participants, and ultimately ownership of solutions and their implementation are increased. Developing rich pictures is a way of helping research participants understand the issues, articulate what is happening and move towards solving problems to help themselves and the team. SSM has also been a way of using the researcher as 'helper' to look at the situation, applying their own experience and expertise and to immerse them in the process in a constructive way.

It is envisaged that future action research cycles will offer refinement of the model, and further problem solving, including reaching out to involve health care practitioners as participants who may be able to make use of the knowledge management system.

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