Application of a Dialectical Model of Soft Systems Methodology to Conduct Action Research

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Introduction

Soft System Methodology (SSM) was developed through action research by Peter Checkland and his colleagues at Lancaster University in the 1970s. This methodology was derived through collaboration with industry to address 'soft' problems in social systems where goals were often obscure as distinct from 'hard systems' thinking which was goal directed to study problems with a desirable goal in mind. (Checkland 1999: 149).

Although SSM has been successfully applied in addressing management problems over the years many managers have expressed difficulties in applying it for various reasons. Bob Dick (2000) developed a dialectical version of Checkland's SSM as part of an action-oriented approach.

This paper shows how two doctoral researchers of the Graduate College of Management have used a dialectical model of Checkland's Soft Systems Methodology (SSM) to address problems arising in engineering and business applications when using an action research approach.

Soft Systems Methodology

Soft Systems Methodology (SSM) was developed through the work of researchers and practitioners from Lancaster University in the 70's who found that the methods

developed through the 'hard' systems approaches – the General Systems (GST) strand and the systems analysis strand - were inadequate to address complex real-world problems faced by managers.

Most people use Checkland's seven-step model proposed in 1975 (Checkland 1999: 163) which involves considering the problem situation in both the 'real' world and the 'model' world where systems thinking is applied to develop root definitions to clarify the real problem and conceptual models to look at ideal solutions.

Essentially the seven steps are:

1. The problem situation 'unstructured'
2. The problem situation 'expressed'
3. 'Root definition' of relevant systems
4. Build 'conceptual models'
5. Compare the 'conceptual models' with the 'real' world.
6. Think about feasible, desirable changes
7. Take action to improve the problem situation.

Checkland himself admits that the seven step model is mainly used for teaching purposes and has discussed the development of the model in practical situations in a 30 year retrospective of soft systems thinking and practice. (Checkland 99). In particular he discusses the enhancements to the models in three more works dealing with SSM. (Wilson 1984, 1990; Checkland and Holwell 1980; Checkland and Scholes 1990). He also discusses some of the issues faced by researchers by reflecting on the link between root definitions and conceptual model to clarify the problems faced during the modelling process. (Checkland and Tsouvalis 1997: 2).

Other authors have also pointed out some problems faced in applying soft systems methodology while conducting research. (Ledington and Ledington 1999; Rose 1997; Flood 1999 and Mirijamdotter 1998).

The Dialectical Model of SSM

Dick (2003) has considered SSM as progressing through four dialectics.

- 1st dialectic – Between immersion (rich picture) and essence (root definition) where researchers try and experience the problem situation as fully as possible and then stand back and define its essential features.

- 2nd dialectic – Between the essence (root definitions) and the ideals (conceptual model) where the researcher try to find an ideal way to achieve the same transformation of inputs into outputs.

- 3rd dialectic – Between ideals and reality where researchers think about improvement to the ideals or the actual situation.

- 4th dialectic – Between plans and implementation where the plans are implemented and differences between plans and reality can be monitored through which further improvements can be carried out .

Dick's proposed way of using soft systems thinking is more 'action' driven than 'concept' driven and seems to have been easier to adopt while putting soft systems thinking into practice by researchers at Southern Cross University.

Case 1:

Application of the dialectical model to developing an expert system

Checkland's soft systems methodology was adopted to design an expert system by Dr. Tay Boon Hou in Singapore. After facing difficulties in using SSM Dr. Tay and his colleagues used the dialectical mode of SSM proposed by Dick to complete their design.

The researcher and his co-researchers decided to use the seven stoep SSM model to help with their diagnostic modelling. The researcher and one of the modellers, Tom, first drew a rich picture of the problem sinuation. Then they developed a root definition of the system to precisely describe the essence of the system being investigated. A logical analysis was carried out using the mnemonic CATWOE recommended by Checkland (1999: 24-25)to ensure that the root definition was adequate.

(C stands for customers or beneficiaries of the system, A refers to the actors who transform inputs into outputs, T refers to the transformation that is happening to derive outputs from inputs, W refers to Weltanshauung or worldview and E refers to the constraints imposed by the environment)

A cultural analysis including a role analysis, social system analysis and political analysis were also carried out by the researchers.

After this three conceptual models were developed by Tom. The researcher carried out four reviews with Tom to discuss the progress of the modelling design based on the analysis done using SSM. While there were initial problems with the progress everything seemed to go well after the third review. But at the fourth review Tom became very upset as the report that he prepared for approval by the client had been rejected. Tom ultimately resigned his job and left the company.

The researcher then carried out an analysis of what went wrong and one of the issues that was recognised was that they had been unable to apply the SSM properly as they could not understand the deeper intended meaning of the SSM process. They found the lack of standard criteria created confusion about adopting an appropriate perspective to guide the modelling process. This issue has also been discussed by Mirijamdotter (1998) who points out that Checkland's SSM does not offer a standard set of criteria against which different perspectives can be measure or fulfilled. Evetnually the researchers got stuck at step 4 of the seven step modelling process.

The researcher then studied the dialectical model of SSM proposed by Bob Dick (2000) due to the following reasons:

1. The researchers were able to incorporate their problem situation (the vehicle being modelled) the Diagnostic Expert System (DES) model and the tasks to be performed to model the vehicle into a framework that fitted the fours stage inquiry process proposed by Dick.

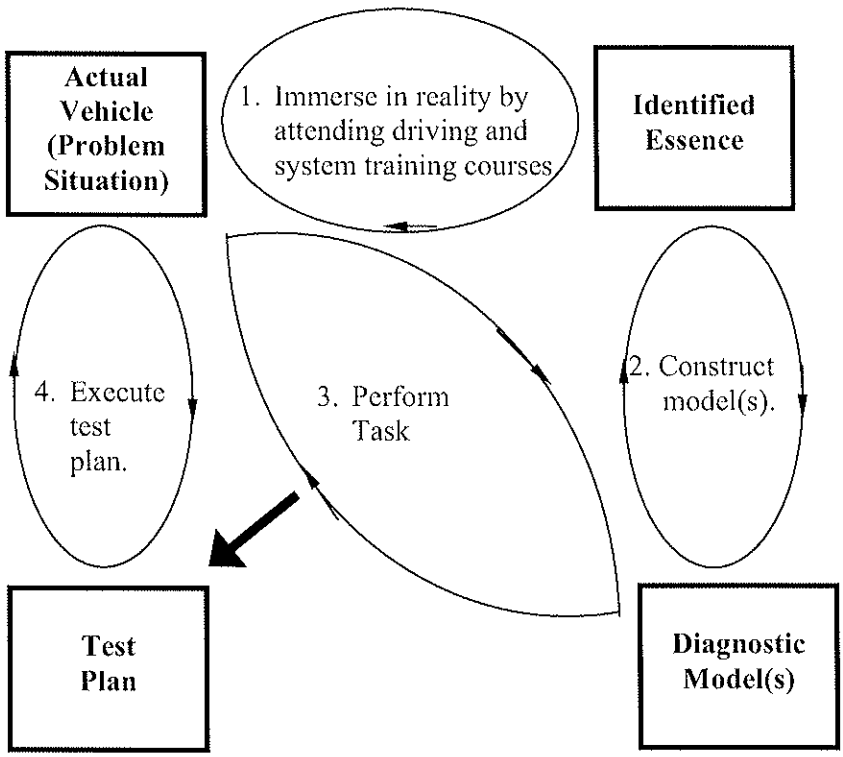

Figure 1. The 4-Stage inquiry process.

2. Using the dialectic model permitted frequent revisits to the problem situation to fine-tune the model.

3. The four tasks in the inquiry process could be built into action research cycles.

First sub action research cycle

In this cycle, the modeller immersed himself or herself in the problem situation. The modeller did so by attending the driving course and the maintenance course. He or she tried to capture the essence of the vehicle by operating one of the vehicle operations such as starting, driving, stopping or parking the vehicle. He or she l then selected one of the vehicle operations. In this sub action research cycle, the modeller switched between the real vehicle and the descriptions of the selected vehicle operation as many times as needed until a satisfactory description of that vehicle operation was obtained.

Second sub action research cycle

This sub cycle was used to construct the Diagnostic model for that vehicle operation. It is the dialectic between the essence of the vehicle and the DES model. As suggested by Dick (1993), the modeller forgot about the real vehicle and concentrated on the derivation of the Diagnostic model from the essence of the vehicle obtained in the first sub action research cycle. This was to ensure that the modeller was able to capture the wholeness of the vehicle operation. Again, the modeller alternated between the essence and the Diagnostic model until he or she was satisfied with the final Diagnostic model.

Third sub action research cycle

This sub cycle was the dialectic between the DES model constructed in sub action research cycle 2 and the real vehicle. Here, the modeller performs a task analysis. According to Gordon (1994) and Dix, Finlay, Abowd and Beale (1997), task analysis is the process of analysing the way people perform their jobs which include the things they do, how they act and the things they need to know. Thus, the objective of task analysis in this sub action research cycle was to derive all the required inspection and repair tasks needed by the DES model. This sub cycle was repeated where necessary until the modeller was satisfied with the derivation of all mandatory inspection and repair tasks. At the end of this sub cycle, the modeller would determine the set of fault cases based on the failure causes. The cases are then consolidated into a test plan.

Fourth sub action research cycle

This sub cycle is the dialectic between the test plan and the real vehicle. The test plan is verified against the real vehicle. The modeller compares the DES model to the real vehicle and notes down the differences encountered during the execution of the test plan.

Based on the differences generated in the fourth sub action research cycle, the entire 4-Stage enquiry process is repeated until all the differences have been addressed. The final product is an abstract model for the selected vehicle operation. Upon completion of the selected vehicle operation, the entire 4-Stage inquiry process is then repeated to derive models for the remaining vehicle operations.

4. The process supported a top down approach which helped the modellers to capture the wholeness of the vehicle first before they proceeded to work on lower levels.

Figure 2 illustrates the top-down approach used in modelling a selected vehicle operation such as starting, driving, stopping or parking a vehicle. The modellers begin their modelling at point X. They look at the vehicle as a whole and learn how to perform the selected vehicle operation. Details to be captured by the modellers at this stage are descriptions on performing the selected vehicle operation. Before they proceed to refine their descriptions to include the set of components used in the selected vehicle operation, they have to restart from point X by performing a quick review on the overall aspect of the vehicle. This is to ensure that the modellers remember the wholeness of the selected vehicle operation before they proceed to work on the details of their models. Likewise, to expand the components into smaller sub-components, the modellers have to return to point X again and to refine their models in the direction of the spiral arrow. Ultimately, the modellers will stop at resolution level B as shown in figure 2 due to the given project schedule. It is important to note that the wholeness of the vehicle operation is retained throughout the modelling process as represented by the vertical line C in figure 2. Otherwise, the model will not be complete should the wholeness of the vehicle operation identified at the level indicated by the horizontal line A be lost.

Figure 2 The top-down modeling approach.

ADVANTAGES OF USING DICK'S VERSION OF CHECKLAND'S SSM

Firstly, Dick version of Checkland's SSM is able to fulfil the following criteria needed in diagnostic modelling.

Criterion 1: Frequent revisits to the physical situation

In a given 4-Stage DES inquiry process, there are at least three visits to the actual vehicle. Therefore, in this new approach, sufficient opportunities are given to the modeller to immerse in the problem situation in search for important features that are relevant to his or her problem situation.

Criterion 2: One or more wholeness purposes

Each of the vehicle operations is in fact a wholeness purpose. The 4-Stage inquiry process allows the modeller to work with multiple wholeness purposes.

Criterion 3: A plan that encourages a shared sense of understanding and deep familiarity

The modeller's understanding at the top level is inherited into the lower levels. These gradual accumulations of understanding from the higher levels ensure a shared sense of understanding and deep familiarity.

Criterion 4: Frequent reviews and verifications

The multiple executions of the fourth sub action research cycle ensure frequent reviews and verifications.

Case 2:

Application of SSM to shorten the time required for approval of motor vehicle insurance claims

Dr. Cheah You Sum applied the dialectical mode of SSM to improve the performance of an insurance company in dealing with motor vehicle claims from an average turnaround time of nineteen days to a time of forty-eight minutes during his doctoral research (Cheah 2002).

Consistent with dialectical model the research design was divided into two stages: a 'conceptual stage' covering the first two dialectics and an 'action research stage' covering the last two dialectics.

During the conceptual stage a theoretical model was created to conceptualise the introduction of Business Process Reengineering (BPR) to the insurance company. It covered unstructuring of the problem situation, expressing it, developing a root definition and the preparation and testing of a conceptual model. It included a literature review as well as interviews of subject experts to develop the conceptual model.

During the action research stage the conceptual model developed was compared with reality, feasible and desirable changes were implemented and action was initiated to improve the problem situation.

The research was conducted through two major action research cycles embedded in which were several mini-cycles. In the first action research cycle a reengineering of the business process was carried out by a team in the organisation. The second action research cycle resulted in the application of technology to speed up the motor claims.

Action Research Cycle 1:

In the first dialectic the Reengineering team immersed themselves in reality to study the current state of motor claims approval. This resulted in the mapping of the existing workflow for motor claims approval. In the second dialectic the team redesigned the ideal motor claims approval from a 'clean sheet' by forgetting the experience of reality. In the third dialectic the team compare the ideal with the reality to note the differences which resulted in proposals of improvements to reality. In the fourth dialectic purposeful action was taken by removing bottlenecks in the workflow and the development and use of a new database for motor spare parts and a standardised electronic adjuster's report

The result of the first action research cycle was the reduction in the average number of days required for motor claims form nineteen days to six days. But this was not enough so they wen through another action research cycle.

Action Research Cycle 2

The purpose of the second cycle was to investigate if further reengineering (of the front office processes) and the use of technology help them to reduce the time further.

In the first dialectic the team immersed themselves into the reality of the first proto type that was developed in the first action research cycle. This started off with the mapping of the new workflow as it occurred for motor claims. In the second dialectic an ideal workflow was gain developed using a new technology that they had been exposed to recently. A new workflow using digital imaging technology and electronic communication systems was developed. In the third dialectic the ideal and actual were compared to note the differences. In the fourth dialectic feasible and worthwhile changes to the workflow were implemented. Testing was conducted and further improvements were made.

In the end the set out target of forty-eight minutes was achieved.

Dr. Cheah You Sum used the dialectical process in preference to the four-step model as he found it easier to explain to the teams in his organisation and use it. However the processes used actually implemented the seven steps of Checkland's model.

Conclusions

In this paper we have shown how the dialectical model SSM has been used effectively by researchers to address soft, complex problem in the industry in two applications. One of these applications was the use of SSM to address an engineering problem while in the other case it was used in an insurance industry to improve the business process to lead to competitive advantage. Both the researchers preferred to use the dialectical model of SSM as they found it less confusing and more attuned to action.

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