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Reflections on the teaching of SSM

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Abstract

This paper describes some reflections on the teaching of SSM over a significant period of time. It provides insight on areas of where students have difficulty with the implementation of SSM in an experiential learning context. A generic conceptual model is also provided as this has proved helpful for students in constructing their conceptual models.

Keywords

Soft systems methodology, SSM, general systems theory, information systems, teaching

INTRODUCTION

There has been a subject called General Systems Theory (GST) on the books and taught at the University of Canberra for over 25 years. Over most of this time, as part of an experiential learning approach, there has been a requirement for student groups in this subject to undertake some form of systems study on a human activity system of their choosing. Initially, students had some choice in the methodology for the study, but over the last ten years or so, this choice has been restricted to some form of Soft Systems Methodology (SSM). The appendix contains an abbreviated statement of a recent version of the assignment requirements.

The author has been involved in this subject in one form or another for over 20 years, and has been the subject convenor for all instances of the subject over the past ten years. During this time considerable experience has been gained in the teaching of SSM, along with how student groups attempt to implement SSM in a real world context. The author has regularly reflected on this experience and this paper is an attempt to share some of these reflections with a wider audience with interests in SSM and its applications.

Any attempt to teach is clearly dependent on the audience, their interests, their capabilities and their motivations with respect to the particular subject matter. Teaching similar material to different audiences is likely to produce some alternate outcomes, but may also produce many similarities. In the case of GST at this University, it has been a 3rd year elective in the Bachelor of Information Technology course and has also been open to students from outside of IT where they are doing an Information Systems major. Around 80% of the students have been IT students, with the balance from a variety of other disciplines including various areas of social science and education.

The experiential learning approach adopted for this subject is consistent with the constructivist learning methodology. Savery and Duffy (2001) outline a number of principles that characterise constructivism, and the teaching approach has generally been consistent with these principles:

- understanding is in our interaction with the environment
- cognitive conflict or puzzlement is the stimulus for learning and determines the organisation and nature of what is learned
- knowledge evolves through social negotiation and through the evaluation of the viability of individual understandings

The nature of this research means that it is hard to collect up simple quantitative data to support the various conclusions, however there has been substantial qualitative data to draw upon and use for these reflections. Students have been required to reflect on their use of SSM, and as part of that, attempt to define some characteristics of SSM (similar to the core characteristics defined below). In addition, students were individually examined every year, where at least some of the exam questions tested their knowledge and understanding of SSM. Both of these sources have been useful at gauging the success, or otherwise of the teaching approaches.
We start off with a very brief description of SSM which then leads in to a discussion of what might be seen as some core characteristics of SSM. These characteristics and then used as a basis for looking at the performance of students with respect to these areas of SSM. Other issues are also raised where they may prove useful in considering the teaching of SSM.

**SOFT SYSTEMS METHODOLOGY**

The early version of SSM was originally introduced by Checkland in the 1970's, and was subsequently expressed in a comprehensive form in Systems Thinking, Systems Practice (STSP) (Checkland 1981). This early model of SSM is commonly referred to as the 7-stage model. In subsequent work, a much richer form of SSM was introduced, which I will refer to as the 2 stream model. SSM in Action (Checkland and Scholes 1990, chapter 2) provides a good description of this model. This form of SSM is characterised by 2 streams of analysis, the logic based stream and the stream of cultural analysis, and is depicted in figure 1 below.

While the activities in the stream of cultural analysis (analysis of the intervention, a consideration of the social situation, and a political analysis) were mentioned in the discussions of the earlier 7-stage model, none received an explicit mention as a specific stage in this model and were probably seen as being less important in the earlier model.

The logic-based stream of analysis contains some of the significant systems thinking, where idealised models of possible versions of the system are compared with the real situation as a catalyst for thinking about possible
desirable changes. This comparison activity is common to some other systems thinking approaches, and in the case of SSM, the idealised models are usually referred to as “conceptual models”. A generic model for these is provided below.

**CORE CHARACTERISTICS OF AN SSM APPROACH**

SSM is an approach that allows considerable flexibility and adaptation in its use. In the GST assignment, students are asked to provide a justification as to why the approach they have adopted should be considered to be an implementation of SSM (or not) – (see the assignment specification in the appendix). A useful means for addressing this issue is to list a number of criteria or characteristics that are core issues for an SSM study and then to see how the approach taken performs against these criteria. Below is a list of criteria that the author sees as addressing this issue of whether a systems study really adopts an SSM approach:

1. The recognition of the validity of multiple perspectives, and that reality is socially constructed, continuously – this picks up on the interpretive stance of the soft systems nature of the study;
2. The creation of a learning system where many of the system actors are key participants in the study process and are undertaking the study on themselves, possibly with the assistance of an outside facilitator with expertise and experience in SSM. In other words, the SSM study is a system in itself which empowers the actors within it to take action to improve their situation;
3. The use of systems thinking in the study including the adoption of many of the artefacts explicitly mentioned in SSM literature such as root definitions, CATWOEs, rich pictures, conceptual models, social and political analysis, etc. Issues around the core concepts of systems thinking, such as emergence and hierarchy, communication and control, should also be evident from the study;
4. The comparison of the real world against some abstract, ideal system models in order to learn about it. These provide a source for debate about possible changes.

It is interesting to note that this list is significantly different, with little or any overlap with the constitutive rules provided by in STSP (Checkland 1981, quoting Naughton 1977, p 253). However, there is much more in common between these points and the constitutive rules provided in the 30 year retrospective (Checkland 1999, quoting Holwell 1997, p A35) and other discussion in that section, showing how much the thinking about SSM has evolved over time.

Core characteristic 1 – social construction of reality

The interpretive nature of SSM is fundamental and even built into the name of the methodology with the use of the term “soft”. Despite this, many students have problems coming to terms with the interpretive nature of SSM, as much of the thinking underpinning IT courses tends to be positivistic in nature, with organisations presented as goal seeking decision making entities. Students from other disciplines, notably the social sciences, typically have fewer problems with the concepts in this area.

One of the obvious means for this to be implemented in an SSM study is for there to be multiple root definitions, many of which are at the same hierarchical level and consider the same issues from the different perspectives of the various participants. This point is made repeatedly to students, but despite this, some come back with single root definitions for each of a number of subsystems, essentially giving a singular view of different parts of the system.

As the root definitions are fundamental to the work over the rest of a study, it is important to get a good working version of these early and to give students feedback on their attempts in this area. This feedback can be achieved either formally, by getting students to provide preliminary submissions containing the various root definitions along with other contextual information about the system and the study. Alternatively, having students bring along the developing artefacts of their studies to tutorials and working on some of these during tutorials is a means of providing less formal feedback, but quite useful all the same.

Core characteristic 2 – the SSM study as a learning system

The creation of a learning system is an area that many students have the most difficulty with. This is partly explained by the tendency to adopt the 7-stage model (discussed below), and as a consequence, the issues around the intervention and its analysis receiving less priority than is desirable. More recently, this analysis of the intervention has been made quite specific in the assignment specifications (see the appendix), which has helped but perhaps not as much as is desired.

A further factor in this area is that the student groups have to go out looking for a system within which to undertake their SSM study, rather than the system and its participants looking for a facilitator to help them with
a problem situation. This tends to make the system and its actors more reluctant to devote significant amounts of time to such a study and this is compounded by the issue that their facilitators are students who are just learning about the approach to be adopted, thus creating a credibility gap.

The perception of this credibility gap by the students also compounds the situation so that many of them end up behaving like consultants who are outsiders imposing a study on the system under examination. The issue of the SSM proponents being perceived as consultants is discussed at some length by Checkland and Scholes (1990) in the case study in Chapter 5 of SSM in Action. One of the impacts of this in the case study was that the outcomes of the study were written up in a report that ended up on the shelves of the participants and became divorced from any actions to improve the situation.

This sort of outcome is also not uncommon for the student initiated SSM studies and there are also many instances where the students don’t even share their “recommendations” with the system actors, thus moving them even further from a learning systems context. The author has been aware of this outcome for some time and talks actively with the students about this, but accepts it is difficult for the students to overcome these problems due to the nature of their SSM studies as noted above. Perhaps a greater degree of engagement between the lecturer and the participants and owners of the systems may help to reduce the credibility gap noted above, but this is still a difficult area.

However, despite these problems, having students reflect on issues around this is a means to promote some learning on these issues, even if the outcomes of the SSM studies are less than optimal in this area. The appendix shows a way to get students to reflect on their SSM studies, and the author believes this to be an important component of such an assignment, particularly given that many exogenous factors can limit the effectiveness of the SSM study itself, and the reflections are a means of determining the extent of student learning about SSM including instances where their SSM studies have been less than successful.

Core characteristic 3 – the use of systems thinking and SSM artefacts

As a general rule, this characteristic was more successfully implemented than most. This is partly because of the mechanistic nature of following a set of instructions about how to create many of these artefacts, and partly because these are the more obvious areas that students will tend to concentrate on and expect that if they have got these basics right, then they have done most of the work.

Some aspects of this area are more difficult than others, conceptually, and these are the areas students tend to have more difficulty with. Of some note here, the creating of conceptual models is one of these more difficult areas. To facilitate activity in this area, the author created a generic conceptual model and this is described in a section below.

There are a number of other approaches available to SSM proponents for the creating of conceptual models and a number of these have been explored by students or in tutorials. One that is sometimes used in the teaching of SSM elsewhere is the Decision Variable Partitioning approach (Ledington and Ledington, 1996), but this author has found that students tend to find this more difficult than more traditional forms of the conceptual models, as represented by the generic model below.

A further issue in this area is the general lack of attention given to elements of the stream of cultural analysis such as: the analysis of the intervention (discussed above); the analysis of the social system; and the analysis of the political situation. These latter two are discussed below in the section on the 7-stage model versus the 2 stream model.

Core characteristic 4 – the comparison stage of SSM

This comparison of the real world with constructed system models is important to many systems approaches, but seems to be fundamental in SSM. To a large degree, this activity is dependent on having useful conceptual models, and it has been quite evident that once a useful generic conceptual model has been used in the teaching of SSM, the quality of students’ conceptual models improved significantly, and thus performance in this area also improved significantly.

A further issue in this area is that some of the activities explicitly mentioned on conceptual models, such as some of the monitoring, can be done in informal ways in the systems under consideration. Generally, this is an area where students with limited real world experience in organisations find it difficult to make judgements about whether these activities are being performed appropriately at this informal level, or need more explicit formalisation within the systems. This issue is also compounded by the problems noted above under Core characteristic 2, where the students have difficulty in creating a learning system with full participation by the relevant actors and thus lack the confidence to properly discuss these issues with the system actors and owner.
7-STAGE MODEL VERSUS THE "2 STREAM" MODEL

As noted above, the early version of SSM introduced by Checkland in the 1970's and expressed in STSP (Checkland 1981 p 163), is commonly referred to as the 7-stage model. In subsequent work, the richer form of SSM was introduced, referred to as the 2 stream model (see figure 1 above).

The activities in the stream of cultural analysis include an analysis of the intervention, a consideration of the social situation, and a political analysis. While many aspects of the considerations in these areas were mentioned in the discussions of the earlier 7-stage model, none received an explicit mention as a specific stage in this model and were thus seen as being less important.

Since the release of SSM in Action, student groups have been given definite encouragement to adopt the 2 stream model of SSM, however, despite this encouragement, there have been a tendency for many students to use the 7-stage model. Even when the 2 stream model has been used, there is a tendency to significantly underplay or almost ignore the stream of cultural analysis.

This adoption by students of the 7-stage model is consistent with comments made by Checkland in his 30-year retrospective (Checkland 1999, p A13) where he notes that the 7-stage model is easier to teach, and easier to understand. A quick survey of SSM material on the Internet, including course notes for other tertiary institutions also reveals a significant majority using the 7-stage model with very few making much mention of the 2 stream model, reinforcing the comments about it being easier to teach. This may also help to explain the tendency of students to adopt this version of the model as many will show a definite preference to searching the Internet for reference material over using hard copy references, even if they have been provided to them in reading brick form.

Checkland in various works also makes the distinction between “method” and “methodology”, where the term “method” is used to refer to a particular instance of the application of a methodology. The author’s perception is that students without significant real world experience find this distinction somewhat problematic and they would like SSM to provide them with a simple set of steps to follow, in many ways like a recipe. As such, the 7-stage model seems to conform much more closely to this picture and this would have to be a significant element in the adoption of this form of the model by students.

In the context of SSM studies, there seems to be some reluctance for students to undertake a proper political analysis, and to a lesser extend, a social system analysis – while it is difficult to find the full motivation for this, it seems as if there is a lack of understanding of the significance of these issues in an organisational or human activity context. This could be explained by the very limited, if any, organisational experience that many of these students have, although I would contend that some people will never fully appreciate the social and political realities of human activity situations. But it would certainly seem that until one gets a reasonable level of experience with these issues in real world settings, it can be difficult to appreciate their important in human affairs.

CONCEPTUAL MODELS

To tackle a more technical issue of SSM, it has been apparent that many students have had problems with the construction of conceptual models from their root definitions. After repeatedly referring them to typical examples of conceptual models, and also providing some basic instruction, problems were still evident in this area. This has led the author to construct a generic conceptual model (figure 2 below) that has proved quite useful in helping students in this area.

It was interesting to note that Checkland has written quite a bit about building conceptual models – of some note is Appendix 1 of STSP (Checkland 1981) and Chapter 2 of SSM in Action (Checkland and Scholes 1990, pp 36 to 42), and these sources have been part of the material used for the basic instruction of the students. There is also more in SSM in Action, including many typical examples in various case studies. The material in STSP does include a generic model, but in many ways, this seems to be too general for the students to properly grasp the issues and facilitate their conceptual model construction. However, when you look at many of the examples of actual models given by Checkland in these sources, a number of patterns start to emerge. The generic model in figure 2 has attempted to capture some of these patterns and has proved very useful in the teaching context.

The generic model still requires students (or other system modellers) to expand out the set of tasks in the “operation/implementation” area, using the particular circumstance of their root definition, but it certainly makes it quite explicit that an ideal system has other significant activities that need to be included on the conceptual model. It also helps to illustrate how the owner’s interests are different from those of the actors, both elements of the CATWOE that can be easily confused.

This generic model also has the benefit of reifying one of the core systems thinking concepts of control and regulation, or as Checkland often refers to it as, communication and control. The issue of control is clearly
picked up by the various monitoring activities which help to close various loops. Checkland has also introduced ideas around the 3 E’s, for example p 39 SSM in Action (Checkland and Scholes 1990), and pA25 30-year retrospective (Checkland 1999) – efficacy, efficiency, and effectiveness – and this model helps with the understanding of the level at which each of these operates.

CONCLUSION

While not comprehensive, the discussion above provides some useful pointers to facilitate the teaching of SSM within a general systems theory and information systems context. The experienced gained over 20 years has had an impact on the performance of SSM studies by students with a shift away from the more mechanical implementation of a recipe or standard method to a situation where many more students are starting to come closer to the standard expressed under the core characteristics of SSM, above. This has resulted in many more students coming away with a better understanding of what SSM really means.
A generic conceptual model has also been introduced and it is clear that this has had an impact on the teaching of SSM. The author would also suggest that this generic conceptual model could prove quite useful in the general practice of SSM.

**BIBLIOGRAPHY**


**APPENDIX**

The following represents the core components of an assignment on SSM.

For this assignment, student groups are required to choose a human activity system with a significant information systems component. It is preferable that groups select a system to which some of the group members belong. The group should then use a recognised implementation of soft systems methodology (SSM) to study this system. Peter Checkland’s evolving ideas on SSM are a useful starting point, and groups should justify how this study is an appropriate use of SSM.

The group choice of a system needs to recognise that SSM is more useful as a tool when there is a problem situation with the system being studied.

An initial report outlining the preliminary investigations should be submitted mid semester. It is expected that this report will include a brief description of the system and any problems that may initially be evident; statements of a number of root definitions for the system and associated CATWOE’s (you will need at least 2 RD’s and each should have their own CATWOE); at least one rich picture of the system providing some context for the various root definitions; and an outline of the proposed approach and tasks to be undertaken for the rest of the assignment. This should be specific to your particular system rather than a general description of SSM.

A final report should be submitted by the end of semester including:

- a description of the system being studied in systems terms – you may want to use rich pictures to facilitate this description along with other systems oriented diagrams and text;
- an explanation of any problem situation which “initiated” the study;
- an analysis of your intervention in the system, and what impact this intervention had on the system (SSM cannot be seen to have been used if there is no intervention in the system);
- an analysis of the system and a revised explanation for the true problem situation derived from the study process;
- any actions taken, or suggestions for actions, to help resolve the perceived problems in the system;
- a description of the process used for the study and an analysis of whether it was an appropriate approach to facilitate resolution of the problems in this particular system. Students should reflect on aspects of their process outlining what worked well and where things could have been done differently; and
- SSM is an approach that allows considerable flexibility and adaptation in its use. You should provide a justification as to why the approach you have adopted should be considered to be an implementation of SSM (or not as the case may be!).