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Introduction to Soft Systems Methodology

Giles Hindle[a,@]
a: University of Hull
@: Giles.Hindle@hull.ac.uk

1. Introduction

The purpose of this chapter is to introduce you to Soft Systems Methodology (SSM). The assumption concerning the reader is they have no prior knowledge of SSM, but some familiarity with systems thinking. The paper does not include a comprehensive description of SSM, but does outline its history, its fundamental nature and discuss how it might be used in practice.

SSM is one of several approaches, which are often termed problem structuring methods (PSMs) [1,2]. PSMs were developed by a pioneering group of researchers through the 60s and 70s within Action Research programs; the researchers' aims being to identify effective analytical tools and methodological frameworks for dealing with unstructured problems and complex situations. Unstructured problems were seen to involve multiple stakeholders, multiple perspectives, conflicting interests, various types of uncertainties and significant intangibles [1]. PSMs therefore offer "a way of representing the situation...that will enable participants to clarify their predicaments, converge on a potentially actionable mutual problem or issue within it, and agree commitments that will at least partially resolve it" ([2], p.531).

The paper consists of 6 sections. Section 2 provides a brief history of SSM. Section 3 reflects upon the fundamental nature of SSM, but does not constitute a comprehensive description of it. Section 4 discusses common issues with learning SSM. Section 5 presents example case material in order to show the type of analysis found within SSM practice and Section 6 includes final remarks.

2. A Brief History of SSM

The origins of SSM date back to the creation of a postgraduate Department of Systems Engineering at Lancaster University in the mid-1960s. Professor Gwilym Jenkins, the head of the department, hired a chemist Peter Checkland from a science based industry where he worked as the manager of a technology research group. Professor Peter Checkland and colleagues such as Dr. Brian Wilson instigated an action research programme which applied systems engineering methodology to the type of problems normally faced by managers.

Student projects together with a university owned consulting firm (ISCOL ltd) enabled the research team to conduct literally hundreds of projects within organisations in the private, public and third sectors. The systems engineering methodology was adapted and developed over the following decades to create a new methodology - named soft systems methodology.

An early version of SSM was published in 1972 [3], but many would regard the first mature version to be presented in Checkland's first book Systems Thinking, Systems Practice in 1981 [3]. Further books followed including Checkland and Scholes [4], Wilson [5,6] and Checkland and Poulter [7].

For a contemporary description of Checkland's version of SSM the reader is encouraged to view Checkland & Poulter [7], which was specifically written for students, teachers and practitioners. Checkland has also written a useful overview of the development of SSM from his perspective [8], which is included in the latest printed versions of the 1981 and 1990 books (both republished in 1999). Checkland has also written chapters on SSM in an edited book on problem structuring methods [1] and an edited book on systems approach to managing change [9].

3. The Fundamental Nature of SSM

SSM traces its analytical heritage to Systems Engineering – the discipline where an operational system is designed and optimized using an objective function and computer based modelling [3,10]. Checkland and colleagues sought to answer the question: Could the Systems Engineering approach be applied successfully to a broad spectrum of management problems? The answer, according to their research, was no and a softer, more flexible approach began to emerge in the 1970s. SSM maintains some of the flavour of systems engineering by making use of systems models based upon the concept of a "purposeful activity system", but the approach has become much more flexible and generic in nature. It is now oriented towards tackling any sort of complex situation through the experiential learning of a group of participants, rather than the design of a specific operational system.

Contemporary SSM is a multipurpose and flexible methodology and therefore has been interpreted in a variety of ways by academics and practitioners. The version of SSM presented in this chapter is most closely associated with the work of Peter Checkland, as presented in Checkland & Scholes [4] and Checkland & Poulter [7]. SSM is conceived as an all-purpose approach to tackling complex problem situations; an approach which adopts experiential learning and uses systems modeling to structure discussion between a group of participants.

A number of pragmatic assumptions underpin SSM: First, managers are not generally faced with well-defined problems which need solving or clearly defined decisions which need taking. Rather, they are faced with messy situations which are unique, complex, dynamic, social, political, and which contain interacting perceptions of reality. Hence, SSM supports the structuring of complex situations from multiple perceptions.

> "We all live in the midst of a complex interacting flux of changing events and ideas which unrolls through time. We call it 'everyday life', both personal and professional…The complexity of problematical situations in real life stems from the fact that not only are they never static, they also contain multiple interacting perceptions of 'reality'." ([7], p.XV)

Second, a manager's role is not solely that of the systems engineer; i.e. tasked with the design and stewardship of an operational system. The manager's task is also cultural, political and strategic. It

includes questions such as “What should we be doing?”, “How should we be operating?”, “Where should we be heading?”, “What relationship should we maintain with this stakeholder?” and so on. Managers are responsible for shaping the future of the organization, not simply maintaining control and/or improving organizational efficiency [11]. Hence, SSM supports a wide range of analytical work including strategic and innovative thinking.

Third, effective problem solving requires the participation of stakeholders from the situation, as opposed to just analytical experts. Working together to express views, generate ideas and reach accommodations for the future may require careful facilitation, but will ensure: (a) the process makes best use of the in-depth first-hand knowledge within the organization and (b) action plans have the best chance of being implemented in practice [1,12]. Hence, SSM overall and the tools within it have been designed to function within a participative workshop type environment.

These assumptions have led to SSM being conceptualized as an experiential learning cycle rather than a decision making approach (like multi criteria decision analysis) or an engineering approach (like systems engineering). There are four main elements to the learning cycle of SSM (see Figure 1): The first is a real-world situation which is perceived as problematical by stakeholders. Our aim is to express the situation “as is” as best we can. Our key objectives are to take a holistic view of the situation, capture alternative viewpoints and to identify key issues. At this stage participants begin to see how strategic or operational the project might become and the plurality of worldviews within the project team becomes apparent. The primary tool used is “rich picturing”, although other qualitative and quantitative data might be included.

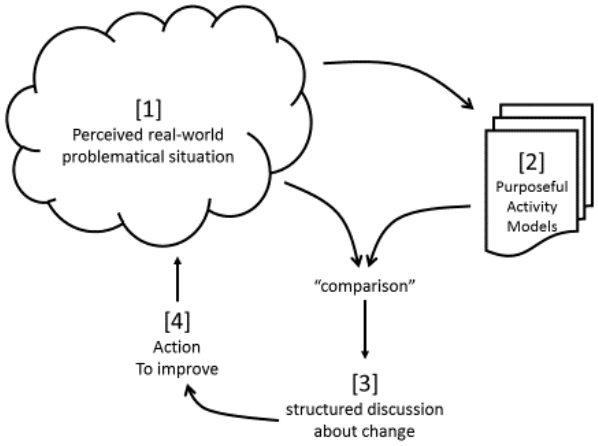

Figure 1: The Experiential Learning Cycle of SSM.

The second element involves purposeful activity models. It is driven by the assumption all situations will contain people at all levels trying to take purposeful action. The modeling schedule is driven by only those issues selected as warranting further analysis by the project team; there is no strict protocol provided by SSM. In this step we might explore the fundamental nature of existing arrangements, develop alternative views of the situation, explore creative future designs or drill-down into specific organizational

processes. The modeling language of SSM is flexible and provides a powerful conceptual language to support and document the thinking process.

The third element of SSM is a structured discussion between participants. This element seeks to develop ideas, agreement and action plans to take the situation forward. This is supported by reviewing elements 1 and 2 through a process of comparison and requires the accommodation of interests within the project team. The fourth element of SSM is action to improve the situation. It is important to note SSM requires action to be taken – it is not meant to be purely an intellectual exercise. Also, it encourages users to view SSM as an ongoing process of experiential learning.

It is important to realise real-world projects will be open-ended, messy and will require iteration between stages. There are two main reasons for this. First, as with all creative processes, participants will have new ideas and change their views as the project develops. It is therefore desirable that participants - as they engage with workshops, reflect on workshop documentation and review their efforts – they are encouraged to let their ideas move forward. Second, it is likely that new designs and action plans may not fully achieve the outcomes intended by the project team. This is due to the complex nature of real-world change processes and should not be seen as failure by the project team. Rather, SSM encourages participants to view such projects as part of an ongoing learning process which in principle is never ending. Hence, the application of SSM ideally becomes part of the culture of the organisation, not simply a one-off project. The hope is that group problem solving and learning should be viewed as an ongoing capability of the organisation.

4. Difficulties learning and applying SSM

This section discusses general issues and features of learning SSM. As mentioned earlier, SSM is an all-purpose methodology which, in principle, can be used in any complex situation. It constitutes an open-ended learning cycle where the users supply the ideas and make flexible use of the systems-based conceptual language. Whilst these properties bestow SSM with admirable flexibility and power, its identity can be difficult for users to grasp. Like an actor who defies classification by tackling a variety of roles or a novel which crosses established genres, SSM can frustrate students who want to know what it is and what they can use it for [10,13].

SSM provides a framework – a set of principles – and a set of tools for analytical work, but it is not formulaic and the ideas and analysis must come from the users. Groups will need to go their own way to some degree with SSM and hence they will produce a variety of unique analytic outputs [7]. This can be an unexpected and frustrating situation for a new user, particularly one from an engineering or scientific background. They may expect a specified outcome to a particular tool and become anxious when assured there is none. Also, SSM has been designed to cope with both strategic and operational issues and users may not be familiar with how these types of issues differ. Users may need support to see why strategic thinking is open-ended and how it is affected by social and political features of the situation [12].

Users with work experience tend to have little difficulty seeing the value of a mapping tool which covers a full range of organizational issues and enables a holistic view of a situation. Users with limited work experience, however, may not always see the value. They might struggle to interpret a description of a

realistic situation and their list of issues might be naive. They simply do not have a viable theory-in-use in relation to organizational situations [14,15].

SSM uses systems modeling, which is a common analytical approach within systems thinking and management science. However, the version found within SSM is at the same time both particular and generic; it can therefore be frustratingly difficult to pigeonhole [10,16]. Evidence of this can be seen in the varied use of the modeling language within the literature and with the occurrence of alleged misunderstandings within the literature [7]. Unlike System Dynamics modeling, for example, which seeks to represent an interconnected set of real-world elements, or systems engineering which seeks to construct a clearly identified operational process, SSM modelling is highly flexible and relates to the relatively abstract concept of a "purposeful activity system". And because the modelling language can be used in a variety of different ways, new users may feel their mastery of the approach is both incomplete and fuzzy.

> "...the secondary literature on SSM teems with misunderstandings, so much so that reviewing some of the most common errors serves to reinforce the true nature of SSM as *a process of inquiry* into problematical situations which learns its way to taking action to improve the situations in question." ([7], p.148)

It is for this reason that practitioners may need to guide users through the various modeling options. It may be sensible to start with the production of models which are intuitively straightforward – for example, a descriptive model of a process or business unit. The primary texts on SSM are not prescriptive in this regard and new users often benefit from clear guidance in the early stages of their projects.

Most published descriptions of the implementation of systems thinking take a relatively scientific stance and assume an expert mode of consulting [17]. The aim is often to show how a particular technique can help the analyst achieve a more objective result. SSM, however, is interpretive in nature and is based upon a participative approach to consulting [3,10]. It therefore can be difficult for users to appreciate the style of analysis required by an interpretive and participative approach to problem solving. For example, because the design of the tools of SSM has been driven by the desire to work within a workshop environment with inexperienced participants, the tools can appear simplistic compared to the advanced systems modeling found in other areas.

5. SSM in Practice

In order to illustrate the application of SSM, this section will present some example case outputs and simple exercises.

Stage 1: Situation Mapping

The first stage of SSM involves examining the situation as a whole and identifying issues. A key consideration is to avoid assumptions about what "the problem" is at this stage. This is important for a number of reasons. First, it's uncommon for people to step back and view their situation in this manner and so it's not unusual for people to develop their thinking and change their minds about what they feel are the key issues. Second, participants often don't know how other people see a situation and can often be surprised; even participants who have worked together for many years. Third, organisations often need

to move forward in their thinking and to innovate their business models and process; it may not be sufficient or even desirable to simply rectify existing arrangements.

Figure 2: A group rich picturing.

Our practical objective is to construct a situation mapping and generate a list of issues. The primary tool used is “rich picturing” (see Figures 2, 3 and 4), which can be done individually or in groups of up to four participants. Groups larger than four can simply be split into separate groups. The tool seeks to represent holistically the situation with elements such as organisational units, processes, services, customers, stakeholders, actors, relationships, environmental constraints, historical processes, key issues and so on. In principle, any key feature of the situation should be represented in the picture.

Figure 3: A group presenting their rich picture to other groups.

The situation is captured on a whiteboard, flipchart or large sheet of paper. The bigger the better, as it gives people room to develop their thinking. Participants are encouraged to create a freehand representation of the situation and to create a list of key issues. Some SSM practitioners like to give instruction in how to create the pictures, but my own personal preference is to give the participants complete freedom. This is because it's the picturing process and the list of issues which are the valuable outputs at this stage, rather than the picture itself. The list of issues is also vital for the facilitator, if one is being used, as it is very difficult to document a rich picture if you are not involved in its construction. If participants have been split into groups, each group will need to present their picture and issues to other groups.

The drawing process is not simply analytical and cognitive – in real world projects where groups are participating, there are social processes playing out too. Participants can be getting to know each other, letting off steam, having some fun and building a working dialogue. There may also be political considerations affecting how participants engage with the exercise.

The focus of the picture is on the here and now rather than on the future, although alternative futures can be pictured at a later stage of the project. The picture constitutes a reasonable summary of the situation, but can be augmented by using "Analyses 1, 2 and 3" from SSM [4]. These are analyses of the intervention itself, the culture of the situation and the political system. There is no space to cover Analyses 1, 2 and 3 in this chapter. It is important that a mapping session, which generally lasts 1-3 hours, is terminated by generating a well-articulated list of issues on a flip chart. This is to ensure the thinking of the participants is accurately documented for future reference.

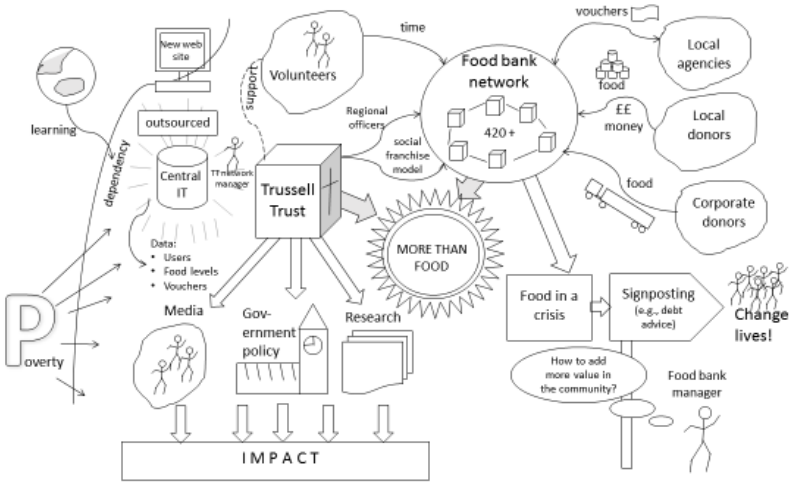

Figure 4: An example of a rich picture.

Stage 2: Systems Modelling

Stage 1, situation mapping, tends to go smoothly in practice. The tool (rich picturing) is efficacious and easy to use, and the conceptual tasks (representing the situation and identifying issues) are relatively straightforward in terms grasping what you need to do. Stage 2, systems modelling, however, is less straightforward.

Stage 2 involves developing a range of models of purposeful activity systems (PAS) which appear relevant to the situation and the issues identified. The flexibility of the modeling in SSM means there are a variety of options open at this point and it is very difficult to predict in advance where the value of the modeling might come from within a particular project. However, a number of common modeling scenarios repeatedly emerge as useful in practice; these will be illustrated below:

Option 1: Creating a baseline model [18]. Here we build a descriptive ("as is") model of a business unit, service or process in order to help the team appreciate and document the fundamental nature of current arrangements. The modeling referent (i.e. the real-world process or organisational unit we are modelling) is viewed as an activity system which transforms some input into some output. We use a system definition (called a "root definition") and activity model to articulate our conceptualisation of the referent. The mnemonic CATWOE is also used to help us build up the systems concept (customers, actors, transformation process, weltanschauung (worldview), owner, and environmental constraints).

As an example, let's take a retail business unit as our modelling referent. This type of model is particularly valuable for SSM beginners as it gives them a relatively straightforward modeling task – i.e. the referent of the model is clear (a shop) and the purpose of the model building is traditional (i.e. to describe the referent as it is now). This type of modeling therefore feels intuitive and familiar to many participants. It helps that the modeling process is analogous to a scientific process in terms of purpose – i.e. to represent – although there is no claim to objectivity in SSM. Baseline modeling is relatively

trouble-free for users as long as they are supported by practitioners, although they will need to appreciate the technical rules of the modeling technique [7], which will need some practice.

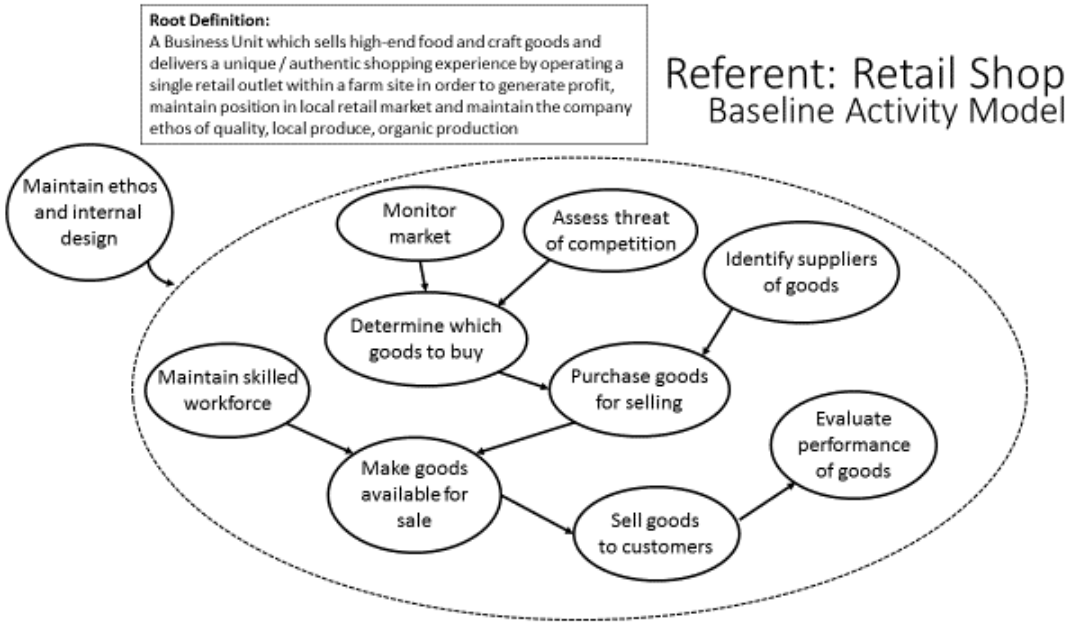

Figure 5: Baseline model of a retail shop.

Option 2: Create design models [18]. Here we use exactly the same systems modeling approach and refer to Option 1, but we construct new designs (or alternative views) of the business unit, service or process. Participants are encouraged to explore a range of alternative views of the referent from conservative new designs, to evolutions of existing arrangements, to radical new directions. The emphasis is on developing creative new designs and exploring new ideas. We might develop designs which achieve improved efficiency, or create increased value for customers, or make use of alternative technologies or even adopt new business philosophies. In principle, there are no limits to the design thinking with this type of modeling. The process is analogous to an architect building a scale model to help visualize a new building or an advertising team developing storyboards to test client reactions to branding ideas. Because there will always be different points of view as to how a particular system might be innovated, it is important to encourage participants not to become too attached to their system designs at this stage. Ideally, we want this stage to be more about exploring ideas than about selecting designs to take forward.

As a case example, imagine a manufacturing company which produces speakers for the hi-fi market. They want to innovate their business model to provide increased customer value. Their customers are independent retailers of hi-fi equipment so we can assume they will value popular products ("good sellers"), good delivery (quick, reliable, easy ordering) and profitable margins. Therefore the company could innovate their business model through improved marketing – i.e. make their products more visible and desirable in the market – and improved order/delivery performance. The latter improvement could even become a source competitive advantage by offering to automatically control and optimise the inventories of selected customers. See Figure 6 for a design model conceived in this way. Note, this

particular design would not change the system definition, but the W in CATWOE and (particularly) the activity model (when compared to the baseline model) would have changed.

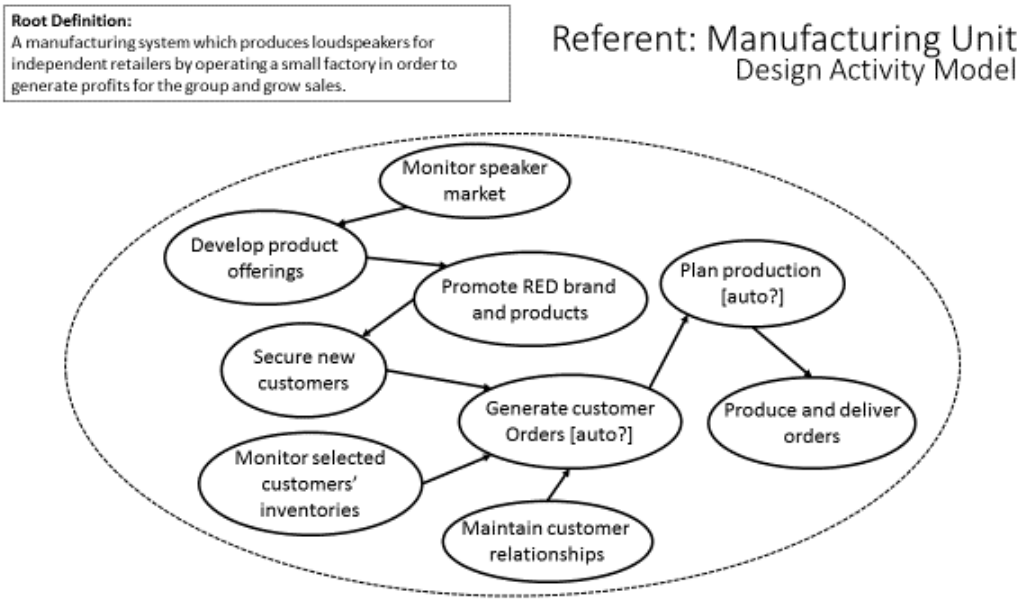

Figure 6: Design model of a manufacturing unit.

This design model (Figure 6) is relatively conservative. The basic definition of the system is similar to before, but the notion of improving value has been explored. In this instance, it is the activity model which has proved the most useful tool, as it has enabled the analyst to think through how innovations within marketing and inventory management might be enacted.

Users should also be encouraged to explore more radical design models, so that a full range of design options are available. More radical models of the company might include: Focusing only on the production of truly innovative speaker designs (rather than mainstream popular designs); changing the target market (perhaps selling direct to end users online); broadening the list of products (developing computer speakers, for example); using the existing sales team to sell in a different market (i.e. seeing sales as as core competence); and so on. In practice participants may be reluctant to create radical models as they might assume they cannot be implemented. However, this should be overcome as they often generate interesting lines of thought which might be relevant in the future.

As well as modelling the business unit as a whole, users could also develop sub-system design models. For example, they could model the R&D function of the company (is it a system to generate innovative new products or a system to incrementally develop existing products?); the production planning function (thus integrating sales and production functions); the delivery function (to improve delivery performance); and so on. Even with a relatively straightforward manufacturing business there are many options for design thinking.

Option 3: Create theoretical models [18]. This type of modeling takes a pure worldview or theoretical position and articulates it through a system design. For example, we could choose to view a prison as a system which educates inmates to become improved criminals and build a model of a prison from this explicit point of view. Clearly, this would not constitute a baseline or a design model. Such a model would enable us to explore how this worldview might be grounded in the reality of the organization.

In a recent consulting project, a local authority organization in England was interested in exploring the normative theoretical position that local authorities should focus on improving the "well-being" of their local populations. We therefore constructed a theoretical model of a system to improve the well-being of a local population. Comparison of the model with current arrangements enabled participants from the local authority to see how the theory might (or might not) be grounded in practice within a local authority context. Unlike a design model which in principle tries to function as a blueprint for a business unit, service or process, a theoretical model can remain relatively abstract – simply exploring the logic of the particular theoretical position.

Option 4: Create a model of a temporary system which achieves a short term objective. The purposeful activity system concept is suitable for modeling systems to achieve short term change objectives or to model any kind of temporary organizational project [19,20]. For example, a business which wanted to develop a culture of client responsiveness might construct a model of 'a system to improve the responsiveness of staff to customers needs'. Such a model would help participants think through how this objective might be achieved in practice – perhaps through a process of training and review, for example. Other examples might be 'a system to implement a new IT system', which would be useful to a team responsible for enacting such a project. Or short term projects to improve profitability in the next six months or to improve customer experience in the next six weeks. These ideas would lead to the construction of a model of 'a system to increase short term profitability' and 'a system to improve customer experience'. This modelling exercise would help participants think through how this might be achieved in practice.

Stage 3: Action Planning

The final stage of SSM concerns developing ideas and action plans to take the situation forward. This is a mostly discursive stage which involves reviewing stages 1 and 2 and reaching accommodation between participants. In some cases, it can be useful to perform systematic comparisons between activity models and present arrangements. Here each activity in the model is compared with existing arrangements (in a table) to determine the precise differences between the two. The comparison enables participants to evaluate the viability and desirability of implementing new ideas and designs.

6. Final Remarks

This chapter constitutes an introduction to SSM. The paper presents the history and fundamental nature of SSM and goes on to discuss challenges associated with learning SSM and describe the practice of SSM. Some case study examples are provided to show how the tools of SSM are used in practice.

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