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A Case Study on Achieving Legitimation in Information Systems Action Research Projects

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Abstract

Theoretical and practical aspects of strategies for achieving legitimacy in Information Systems projects are not a widely researched topic. Legitimation is particularly relevant for projects involving action research interventions though it is desirable also in those including observations. An overview of action research and of past work on legitimation strategies in Management and Information Systems is provided. The paper then illustrates the practical application of heuristics for achieving legitimacy proposed by Landry and co-workers originally in Operations Research to an intervention aiming at improvement of software development productivity in an outsourced information systems project. The findings, limitations and possible directions for future research are presented.

Keywords: Legitimacy, Legitimation, Information Systems, Action Research, Systemic Intervention, Operations Research.

1. INTRODUCTION

Legitimation in projects is related to the likelihood for a successful implementation (see Landry, Banville and Oral, 1996:444). We explore it in the context of systemic action research interventions in the Information Systems field. There are several issues that need clarification for the purposes of this research.

The first one is *what characterizes the systems approach*. Midgley (2011:5) states two assumptions that are fundamental to most (if not all) systems approaches: everything in the universe is directly or indirectly connected to everything else, and that our understandings in any situation are inevitably limited.

The second issue is about *the nature of action research* whose outcomes are both an action and research. That is different from traditional positivist science aiming at creating knowledge only (Coughlan and Coghlan, 2002). Action research often takes the form of an intervention and in relation to this we may point that according to Midgley (2011), some authors oppose the practice of *intervention* (which assumes that theories are more or less useful) to that of *observation* (which assumes that theories reflect reality).

The third issue is about *understanding legitimation*, an abstract and indefinite concept (Hybels, 1995:241) about how to achieve legitimacy. Its various related theories that emerged prior to 1995 were unified in an integrative study that produced a widely

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accepted in the management field *definition for legitimacy* as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995: 574). Aspects of the above issues are further discussed in the second and third sections of the paper. We may point that legitimation is particularly relevant for projects involving action research interventions though it is desirable also in those including observations.

The *purpose of the paper* is to report a case study on the application of the only published heuristics for achieving legitimacy in Operations Research (OR) (see Landry et al. (1996) to a pluralist systemic action research in the field of Information Systems development. It provides a practical contribution to systems thinking and legitimation applied to Information Systems by illustrating the application of previous related work originating in Operations Research.

The paper proceeds with a brief review of the nature of systemic action research followed by an overview of past research on legitimacy and legitimation strategies in Management, OR and Systems Thinking and Information Systems. The legitimation heuristics proposed by Landry et al (1996) were applied directly in a real case of a complex systemic intervention related to the improvement of software development productivity in a large outsourced IS project.

2. ACTION RESEARCH AND PLURALIST SYSTEMIC INTERVENTIONS

Systemic interventions in Information Systems usually fall in the category of action research. According to Reason and Bradbury (2008), "*action research* is a participatory process concerned with developing practical knowing in the pursuit of worthwhile human purposes. It seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities". Following Baskerville and Wood-Harper (1998:91), action research is a cognitive process that depends on the social interaction between the observers and those in their surroundings. Action research is generally accepted as being a diverse concept, with many different strands and many different meanings being attributed to the concept over many years

(Stowell et al., 1997:161). The same authors provide an analysis of previous work in the area and identify several uses for action research: it contributes to the practical concerns of people in an immediate problematic situation and to the goals of social science; it develops the self-help abilities of those people facing problems.

A detailed analysis of the historical evolution of the field of action research in Information Systems is presented by Baskerville and Wood-Harper (1998). They trace its origins, decline in the sixties, the fragmentation in the field after 1975 and the current diffusion of various strands across practical fields. The same authors define four distinct streams in Action Research: the original "canonical" form of action research, organisational learning, management consulting and soft systems methodology. There is no uniform homogeneous paradigm for these streams. The prevalent paradigm for the first, second and fourth streams is the interpretive one. The management consulting stream is traditionally based on pragmatism.

A special issue of MIS Quarterly on action research in Information Systems provides several papers reflecting different types of action research applications in IS (see Baskerville and Myers, 2004) including an application of dialogic action research (see Martensson and Lee, 2004). The similarities and differences between action research and design science research are analysed in depth by Iivari and Venable (2009). A synthesis of concepts from both areas is presented in Sein et al. (2011) which was met with interest by IS researchers and practitioners.

The characteristics of action research (AR) for the related field of operations management operations management are discussed in Coughlan and Coghlan (2002). They stress that AR focuses on research in action, rather than research about action in a process of planning, taking action and evaluating the action, leading to further planning and so on; AR is participative; AR is research concurrent with action; AR is both a sequence of events and an approach to problem solving (Coughlan and Coghlan, 2002:223). They note further that AR aims at developing holistic understanding during a project and recognizing complexity. A thorough presentation of the various strands of Action Research and their applications can be found in Reason and Bradbury (2008).

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According to Burns (2007), *Systemic Action Research* has the following characteristics (emphasis is original):

> "It is multi stranded. By opening up more than one strand of inquiry we see issues from different perspectives and begin to understand the complex inter-relationships between issues.
> It involves multiple stakeholders and interest groups both on the ground, within the wider local system, and in more strategic arenas. This allows all of the key players to engage in learning, dialogic and the co-construction of action enhancing the chances that solutions will sustainable.
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> It must be able to link informal inquiry and action with formal decision making systems and networks of power.
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> It identifies the significance of issues through use of resonance rather than representativeness.
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> It is highly emergent in its design mirroring the emergence of the phenomena that it is exploring."

One particular methodology for action research with explicit emphasis on the importance of philosophical justification is Soft Systems Methodology (see Checkland, 1999). It linked Action Research to Systems Science (Baskerville and Wood-Harper (1998)). The links between these two fields are further refined in Checkland and Holwell (2006). The AR framework of Checkland and Holwell (2006) includes a formal methodology (Soft Systems Methodology (SSM)), by means of which new knowledge arising from the problem situation could be defined and against which it could be evaluated. SSM evolved originally from experience within interventions in various management problems in public administration and industrial companies. However, subsequently its applications were increasingly oriented towards Information Systems, a growing field at the time (see Checkland and Holwell, 1998). More details on SSM with relevant references can be found in Appendix A.

Mingers and Taylor (1992:331) summarize some criticisms of SSM: "there are problems in its use - particularly acceptance in the first place, gaining the commitment of key actors, and the extent to which the language of SSM is used explicitly... Weaknesses in the methodology have also been identified, such as the lack of techniques to help with the process of client interaction, difficulties in connecting SSM to information systems, and the inability to deal with situations of power and resistance to change."

Often SSM can be combined with other approaches in order to gain understanding of these complex situations. For example, Petkov et al. (2007) dealt with theoretical and practical issues in mixing SSM and other systems approaches in three large projects following the principles of Multimethodology by Mingers (2001). Further discussion of theoretical pluralism in systemic action research can be found in Midgley (2011). The next section deals with a brief review of legitimacy research in Management and other areas.

3. PAST RESEARCH ON LEGITIMACY AND LEGITIMATION STRATEGIES IN MANAGEMENT AND INFORMATION SYSTEMS

"Legitimacy has often been conceptualized as simply one of the many resources that organizations must obtain from their environments. But rather than viewing legitimacy as something that can be exchanged between institutions, legitimacy is better conceived as both part of the context for exchange and a by-product of the exchange. Legitimacy itself has no material form" (Hybels, 1995: 243). While the above view of legitimacy as an operational resource is typical for strategic legitimacy studies according to Suchman (1995:576), institutional management researchers depict legitimacy as a set of constitutive beliefs. Suchman (1995:572) states that each of the above two traditions is further subdivided among researchers who focus on (a) legitimacy grounded in pragmatic assessments of stakeholder relations, (b) legitimacy grounded in normative evaluations of moral propriety, and (c) legitimacy grounded in cognitive definitions of appropriateness and interpretability.

Suchman (1995) has identified three *general strategies for achieving legitimation*: confirm to the environment, select a suitable environment and manipulate the environment. Further these three types of general strategies are manifested in a number of individual strategies that can be grouped under pragmatic, moral and cognitive

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legitimacy. We focus our attention here only on strategies for achieving legitimation as they are more relevant for the case of implementing systemic intervention and we disregard the other two types of strategies for maintaining and repairing legitimation as they assume longer time spans than what usually is associated with an intervention (see on those Suchman, 1995). More recent progress in legitimation research is reviewed in Deephouse and Suchman (2008), Bednarek (2011) and others.

Among the *open issues in legitimation research one may mention the process of legitimation* (related to the way how various legitimation strategies are used) (see Boxenbaum, 2008, Suchman, 1995) and that is a further motivation for this research. According to Boxenbaum (2008:238) the problem is not that we lack studies on legitimation techniques but that "the studies use inadequate methods as archival sources, textual data, and retrospective interviews form case studies that were selected on the dependent variable are not sufficient data sources for studying legitimation processes; yet they are, by far, the most commonly used in previous studies. These data sources tell us little about what actors think, what they say, and what they do when they engage in legitimation."

The view of legitimacy, supported by Landry et al. (1996:445), assumes that the code against which a model is judged for legitimacy is socially constructed, and thus is much less stable across time and across organizational actors. Legitimation, like validation, is an aspect of evaluation according to Landry et al. (1996). According to Landry et al. (1996:445), "*the big difference between model validation and model legitimisation* is that the code to which the two processes refer is not the same, scientific in the first place and social in the second" (Landry et al., 1996:454). The same authors proceed to ascertain that, while the concern of the Operations Research (OR) specialists is with the validation of the model, "for the other stakeholders of a model, it is model legitimisation that is of importance" (Landry et al., 1996:454). The same conclusions may be applied also to IS researchers and practitioners.

Landry et al. (1996:451) *define a set of nine heuristics that can increase the likelihood of obtaining legitimate models in Operations Research,* though never guaranteeing it. Since most systemic action research interventions employ predominantly Problem Structuring

Methods from Operations Research (see Mingers, 2001) we may extrapolate that the findings of Landry et al. (1996) are applicable also to systemic action research interventions including those in the field of Information Systems. The case study reported in the next section applies the same heuristics directly in the intervention.

Exploring the correspondence between the heuristics proposed by Landry et al (1996) and the legitimation strategies in management identified by Suchman (1995) we find that a potential weakness of the set of heuristics for achieving legitimacy in OR proposed by Landry et al (1996) is that it is not coherent with some of the findings by Suchman (1995). That is an indication for the need for possible expansion of the heuristics proposed by Landry et al (1996) in the future to align them better with the comprehensive work performed by Suchman (1995).

We will discuss next briefly legitimation in Information Systems which is not a widely researched topic judging by the number of publications that go beyond mentioning it. Legitimation research in the field of Information Systems was pioneered by Klein and Hisrchheim (1989) who define legitimation as a social process by which institutions, practices and ideas gain social acceptance. They propose six social factors or forces for analysing the current bases for legitimation. Those factors relate to the areas of: 1. societal attitudes, 2. organizational incentives, 3. the design ideal of economic-technical rationality, 4. hard methods and tools, 5. peer orientations, and 6. the prevailing research paradigm. Banville (1991) expands the work of Klein and Hirshheim (1989) by providing general guidelines for legitimation research without any operational details.

Past research on legitimation in Information Systems can be grouped in two strands. In the first one, Petkova and Petkov (2003b) have provided a post factum application of the legitimation heuristics for Operation Research suggested by Landry et al. (1996) to a failed information systems project about development of a database for faculty research output. That work however suffers from the previously pointed criticisms raised in Boxenbaum (2008). The second strand is based on work by D. Flynn and co-workers using the Legitimation elements in Giddens' Structuration Theory (see Giddens, 1984). Thus Hussain et al. (2004) propose a

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Legitimation Activity Model based on Activity Theory and Structuration Theory. The same approach is extended with concepts from the legitimation typology of Suchman (1995) in Flynn and Du (2012). Only a few other papers discussing legitimation to some degree have been published in the IS literature (see Brown, 1995; Kohli and Kettinger, 2004, and Kaganer et al. (2010)).

According to Lyngstad (2002) legitimacy is influenced by the context of the intervention, professional knowledge and adherence to ethical codes. The same factors impact legitimacy in any other field. The nature of the problem structuring methods (PSM) applied in a systemic intervention helps reveal the context of an intervention as is shown in Petkov, Petkova and Andrew (2013). The interplay between professional knowledge and ethical codes is captured mostly through the heuristics suggested by Landry et al (1996).

We illustrate next the applicability of the heuristics by Landry et al (1996) to a pluralist systemic intervention in Information Systems development. It was conducted as action research based on the principles of critical systems thinking (see Jackson, 2003).

4. A CASE STUDY OF ACHIEVING LEGITIMACY IN A COMPLEX INFORMATION SYSTEMS PROJECT

The intervention involved a real complex and messy IT project in South Africa. It was formulated as an action research project. In the case the first author played the role of facilitator of the intervention.

The intervention was about *understanding what drives software development productivity in a large IS development project* at an aluminium metal processing plant. The company had initiated a large IT project including a significant change in its manufacturing philosophy, production capacity and information technology infrastructure. The project involved a large in-house team and two outsourcing providers – from the USA and Italy. The project was falling behind and hence the need was identified by management of the client company to find ways to improve the work of the teams involved in it.

The intervention took the form of developing and implementing a framework for evaluation of the factors affecting software development productivity used as a vehicle for improving the understanding of the issues surrounding software project management. That was achieved through assessment of the differences in the values of the client and the outsourcing provider and facilitation on reducing the gap in those. A better understanding of such differences was perceived to lead to subsequent reduction of a potential disparity in their values through improved project management. An important aspect of the work was improvement of the perceptions about the legitimacy for that intervention and hence the work reported here which was not published before. Hence the work reported here was about improving the acceptance by both the client staff and the outsourcing providers of the intervention aiming to facilitate better understanding between the clients and the outsourcing providers and thus improve the software development productivity in this large IS project.

The intervention had a critical systems thinking (CST) pluralist orientation. Therefore it was philosophically guided by the three commitments of CST: critical awareness, improvement and pluralism (Jackson, 2003; 303). The authors applied a mix of methods from different methodologies and from different paradigms. The intervention involved applying elements of Strategic Assumptions Surfacing and Testing (SAST) by Mason and Mitroff (1981) and a subset of the Boundary Judgment Questions of Critical Systems Heuristics (CSH) (see Ulrich, 1998). The mix of methods involved also rich pictures and CATWOE analysis, techniques from Soft Systems Methodology (SSM) by Checkland (see Appendix A and Checkland, 1999). Multiple Perspectives on the context were developed various techniques mapped onto the three worlds of Habermas (1984) following Mingers (1997) as is shown below.

The *social aspects of the IS development project* were modelled through techniques from SSM (Rich pictures, CATWOE), Critical Systems Heuristics and Stakeholder analysis.

The issues reflecting the personalities of the stakeholders in the project were modelled through Rich pictures, idea generation (Nominal Group Technique), and Multi-Criteria Decision Analysis (MCDA).

The material aspects of the IS development project were reflected through statistical project data and MCDA.

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It was necessary to identify which factors affecting software development productivity might be most relevant for the conditions of the particular software project and organization. That was done through prioritisation using a multicriteria decision analysis approach, the Analytic Hierarchy Process (AHP) (Saaty, 1990).

The intervention to improve software development productivity in the project involved a careful planning period and informal discussions, accompanied by theoretical research lasting about a two year period, followed by a series of formal workshops applying a mix of systems thinking methods as described above. These were justified on the basis of the nature of the problem and the capabilities provided by individual systems approaches. More details on the use of the various techniques in this intervention can be found in Petkova and Petkov (2003a) and Petkov et al. (2007) and Petkov et al. (2008). The following paragraphs discuss aspects on how legitimation was sought in this intervention, something that was not described in those papers.

The implementation in practice of the legitimation heuristics of Landry et al. (1996) in this intervention are discussed in sequence but they were interweaved in the process of the systemic intervention of concern in several iterations.

Heuristic 1. The OR specialist should be ready and willing to work in close cooperation with the strategic stakeholders in order to acquire a sound understanding of the organizational contract. In addition, the OR specialist should constantly try to discern the kernel of organizational values from its more contingent part.

A careful effort was made to involve all relevant strategic stakeholders. It can be noted that the proposed framework for improvement of productivity in the complex IT project aimed at deepening the understanding of the environment surrounding the intervention through the use of rich pictures, CATWOE analysis and the boundary value questions of Ulrich's CSH. The use of a MCDM approach provided an additional vehicle for capturing the organizational values guiding stakeholder decisions. In this case, the respective facilitator had a close relationship with the plant IS department partly because of

having worked for the same company seven years earlier.

Heuristic 2. The OR specialist should attempt to strike a balance between the level of model sophistication/complexity and the competence levels of the stakeholders.

The inclusion only of rich pictures and CATWOE analysis from Soft Systems Methodology, and the replacement of its technical, cultural and political stream of inquiry (along SSM mode 2) with a simple classification of the issues raised through the Nominal Group technique (NGT) and the boundary value questions of CSH made the process of "identifying the mess" easier in this case. The facilitator provided some training for the stakeholders in the intervention as it was progressing. The suggestion to use the simpler hierarchical AHP model instead of the potentially more expressive Analytic Network Process models (see Saaty, 1990) is another step to achieve a balance between the model complexity and the competence level of the stakeholders.

Heuristic 3. The OR specialist should attempt to become familiar with the various logics and preferences prevailing in the organization.

The techniques employed in the intervention facilitated the revealing of such logics and preferences within the Aluminum plant. The intervention was preceded with a careful preparation and lengthy interaction between the facilitator and the relevant stakeholders to identify such preferences.

Heuristic 4. The OR specialist should make sure that the possible instrumental uses of the model are well documented.

This aspect of legitimization was addressed through careful documentation of the details about the process and the techniques employed in the intervention aiming to improve the understanding of factors affecting software development productivity by the client and the outsourcing providers' staff. The steps followed in the intervention can be seen as proposed procedures having the potential to become standard organizational procedures. One can use the approach in this systemic intervention as part of a set of organizational processes for better coordination in a sense as recommended by Malone et al. (1993). Their purpose is to move beyond the best practices of today and to

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help organizations "invent" new processes, making management more successful.

Heuristic 5. The OR specialist should be prepared to modify or develop a new version of the model, or even a completely new model if needed, that allows one to adequately explore unforeseen problem formulation and solution alternatives.

It has to be noted that the intervention framework was found by the stakeholders to be sufficiently simple to be used, not just with a facilitator in the role of an external OR specialist, but by the relevant stakeholders themselves. One can choose to what depth to go with the CATWOE analysis and the boundary value questions of CSH, as well as choose the factors that should be included in the MCDM model. The users can select between the original AHP and a much simpler multi-criteria approach, SMART, when determining the type of the model.

Heuristic 6. The OR specialist should make sure that the model developed provides a buffer or leaves room for the stakeholders to adjust or readjust themselves to the situation created by the use of the model.

The AHP models we used were seen only as prescriptive or descriptive tool for decision making (following Keeney, 1992) which helped people make better informed decisions. They do not claim to serve as substitutes for deep human judgment. Their aim is just to provide a vehicle for better understanding of the factors affecting the problem situation in a particular intervention. In the case of concern it was about prioritization of the factors affecting software development productivity. The intervention framework had an iterative nature, combining relatively simple techniques aiming to capture human judgment on the many tangible and intangible facets of the problem on hand.

Heuristic 7. The OR specialist should be aware of the preconceived ideas and concepts of the stakeholders regarding problem definition and likely solutions.

This aspect of the recommendations by Landry et al. (1996) was accommodated by considering some preliminary selection of the important factors to be included in the respective decision models, or creating a rich picture in advance, after interviews but before a particular analysis of aspects of the IS development project has

been initiated with groups of stakeholders. We found that applying this heuristic has the potential to save time and increase the acceptance of the relevant framework. It should be carefully considered, however, as there is a potential danger for the distortion of some aspects of the problem situation and for ignoring certain factors affecting software development if they are excluded from any discussions in advance.

Our experience and the responses of the stakeholders to the post-intervention questions showed that the systemic intervention framework for improving software development productivity in this large IS project was embraced by the stakeholders. Hence the effort to increase the legitimacy for the intervention in the eyes of the client and outsourcing teams was successful.

5. CONCLUSION

Due to the relatively high rate of underutilized IS projects in every part of the world, improving their legitimation is a significant factor for improving success of the implementation of IS projects. Using the integrative definition of legitimacy by Suchman (1995) mentioned earlier improving legitimacy can be interpreted as increasing the perceptions of the stakeholders in a project that any actions undertaken in it are desirable, proper, or appropriate within the project context defined by a socially constructed system of norms, values, beliefs, and definitions. This issue is not widely researched in the IS literature as our review showed.

We discussed in this paper the practical application of a set of heuristics for achieving legitimacy suggested in Operations Research to an action research project to improve software development productivity in a large Information Systems development project. In this case we sought greater acceptance for the efforts to improve software development productivity both by the client side and the outsourcing providers. The reported here work involved the direct application of the heuristics for achieving legitimation suggested by Landry et al. (1996) and not post-factum as other researchers mentioned by Boxenbaum (2008).

A common limitation of this type of work is the fact that results from a limited number of cases do not allow to produce generalizable conclusions. May we point that Landry et al.

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(1996) do not claim that their heuristics are usable beyond general guidelines for improving legitimization in interventions and hence they claim that those might be useful even if used only as a starting point on discussion of legitimation in a project. Along a similar line of thinking we claim that our paper illustrates how understanding of the context of an IS project and the application of these heuristics shape the views of the stakeholders on acceptance of the outcomes in a complex Information Systems action research intervention. Hence the findings from this single case study provide some insights and hints on how legitimacy could be improved in an IS project without ignoring the need for additional work on multiple case studies including possible longitudinal studies to reach generalizable results.

While all heuristics by Landry et al (1996) may not be equally important in every IS project they nevertheless point to ideas that are worth considering. They address the following issues as was shown in the case discussed here: the need to seek legitimacy for the IS project in the eyes of all stakeholders; the promotion of decisions and actions that are suitable for the cognitive capacity and value systems of the stakeholders; the flexibility to accommodate the preconceived ideas of different stakeholders and the need to plan for any unforeseen circumstances. From the experience in this project we may conclude that the first three heuristics by Landry et al (1995) deal with improving acceptance of the process of an intervention, while the last four deal with issues related to the legitimacy of the results of the intervention.

Possible further research work may provide further data on justifying additional heuristics to those suggested by Landry et al (1996) or their modifications that may lead to a deeper understanding of legitimation processes in Information Systems projects.

6. ACKNOWLEDGEMENTS

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Appendix A. Some details on SSM

The original formulation of Soft Systems Methodology (SSM) was as a seven stage methodology published in 1981 (Checkland, 1999). It is known these days as "mode 1" SSM (see Checkland, 1999). According to (Checkland, 1999), it is still useful to teach the methodology.

The essence of stages 1 and 2 in SSM Mode 1 is to find out what the problem is. That is summarized in a "*rich picture*" which expresses the features of the situation.

In stage 3 the *root definitions* are formulated by identifying six elements which may be formulated as follows:

- Customers: the victims/beneficiaries of the purposeful activity.
- Actors: those who are involved in the activities.
- Transformation process: the purposeful activity transforming an input into an output.
- Weltanschauung: the view of the world that makes the root definition meaningful in context.
- Owners: who can stop the activity.
- Environmental constraints

In stage 4 the *conceptual models* are built which are constructed by drawing out the minimum number of verbs that are necessary to describe the activities that would have to be present to carry out the tasks named in the root definition.

In the stage 5 the models are compared with reality. Thus one can define in stage 6 likely changes that would have to be made in order that reality better reflect the systems thinking contained in the models. The last stage 7 involves the implementation of changes that are both desirable and feasible.

Some definitions of the techniques are listed below:

- Rich pictures- a cartoon-like picture showing the structure, processes and relationships between structure and processes within a complex messy problem;
- CATWOE analysis- involves identifying the customers, actors, transformations processes, worldview (or Weltanschauung), owners and the environment of the systemic inquiry
- Root definitions of relevant systems needed for the situation- a one sentence definitions of the problem situation.
- Conceptual model- describes the improvement in the problem, based on the root definitions.

The seven stage model of SSM can be used iteratively until there is an understanding and consensus on the complexities.

Mode 2 SSM was introduced as a two-stream inquiry in 1990: a logic-based stream of analysis and a stream of cultural analysis, including also social system analysis and political system analysis (Checkland & Scholes, 1990; Checkland, 1999). Some interpreted this as a replacement of the original seven stage model in SSM mode 1. Others continued to use the seven stage model, especially in educational books. Checkland (1999) assumes that more sophisticated users would apply "Mode 2" SSM as a way of making sense of real-world problem solving activity.

Summarizing the recent understanding of SSM for gaining insight into a situation of concern, Checkland and Winter (2006:1436) mention the "four ways of doing this that emerged:

- Represent the situation in Rich Pictures (Checkland and Scholes, 1990, 44-47);
- Carry out an analysis of the social characteristics of the situation ('Analysis Two': Checkland and Scholes, 1990, 44-50; Checkland, 1999, 16-19);
- Carry out an analysis of the disposition of power in the situation ('Analysis Three': Checkland and Scholes, 1990, 44-51; Checkland, 1999, 19-20);
- Carry out an analysis of the intervention itself ('Analysis One': Checkland and Scholes, 1990, 44-48; Checkland, 1999, 19-20".

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Checkland and Winter (2006:1435) explore for the first time two different uses of Analysis One (or the technical analysis) "within any SSM-based intervention, one devoted to the perceived content of the problematical situation (SSMc) and one devoted to the intellectual process of the intervention itself (SSMp)."

The relevance of SSM to the field of Information Systems has been explored in two directions. One way is to extend the standard SSM method to specify the information requirements of the system as specified originally by Wilson (see Wilson, 1990). The second is through the linking of SSM to existing structured design methods. An overview and detailed analysis is provided by Mingers (1995).

One problematic issue, according to Mingers (1995), is that as SSM and IS embodied different and conflicting epistemologies, there would be no easy way to link them. Mingers (1995:45) suggests that "all design starts as concepts and ideas which are debated and developed but there must be a path towards greater concreteness". The design representations change with time in line with the interpretive paradigm of SSM. The implementation of concepts is viewed as the transition to the real world in SSM "in order to generate real world artefacts".

A detailed critique of SSM is presented in Jackson (2003) and others. Further discussion on the topic is outside the scope of this appendix to the paper.

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