Paradigm Issues in Critical Systems Thinking and Their Interpretation In Three Developmental Systemic Interventions

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Abstract

The paper reviews paradigm incommensurability issues and possible ways of overcoming it. One of the open problems of pluralist systemic intervention theory, on which there is no uniform understanding in the literature, is whether work across paradigms represents some kind of a meta paradigm or whether it belongs to a completely new paradigm itself or should it be grounded within the theory of existing paradigms. Another issue that requires additional investigation is the use of methods within different paradigms from those for which they were created originally. Our understanding of those issues was informed by the developments in Critical Systems thinking in the past decade. It was further developed through by our involvement in three interventions in the fields of rural telecommunications and software development. They involved mixing of techniques from several soft systems approaches and multi-criteria decision analysis. We justified mixing of methods using the theory of the three worlds by Habermas. Our work was influenced by the Multimethodology ideas of Mingers and those on Critical Systems Practice by Jackson. We derive an integrated approach towards the resolution of paradigm incommensurability on the basis of the literature and our experience. Our practical experience in the three cases of concern confirmed our theoretical findings on the feasibility of mixing methods in the same intervention and showed that it is possible to implement the interventions in a way that enables a conversation between the methods involved within the intervention and not from above. Further work is needed however to confirm our exploratory findings from applying pluralist ideas in systemic interventions.

Keywords: Critical Systems Thinking, Mixing methods, Paradigm Incommensurability

Introduction

Pluralism in systemic interventions as a research area has reached a critical mass through the publication of the ideas on Multimethodology (Mingers (1997), critical systems practice in Jackson (2000, 2003) and on the development of systemic intervention by Midgley (2000). One issue that is still unresolved is the universal acceptance of an explanation of the possibility for mixing of methods from different paradigms acknowledging the specific nature of the paradigms involved and this was one of the motivations for this research.

The paper communicates some theoretical and practical reflections of the authors on paradigmatic concerns and their role in three systems projects in the Information and Communications Technologies (ICT) sector carried out by them in South Africa between 1997 and 2002:

- Evaluation of the factors affecting software development productivity within a specific organizational environment.
- Evaluation of the infrastructure of rural telecommunications.
- Planning of rural telecommunications infrastructure.

The problem areas were quite unique and had never before been explored through a mix of systems thinking methods. Hence the contributions of those investigations to the fields of software development productivity and rural telecommunications (see Petkova and Roode, 1999; Andrew and Petkov, 2003; Nepal and Petkov, 2005). The work involved mixing of techniques from several systems approaches along the principles of critical systems thinking. We acknowledge the specifics of the paradigms to which the methods initially belong. The focus of this paper is on the question how paradigmatic concerns inform theoretically the mixing of methods in the same intervention and whether the use of a mix of approaches imposed difficulties from a practical point of view.

The paper proceeds with an overview of the three interventions conducted by the authors. It is followed by a discussion of the issue of paradigm incommensurability. Then we present an integrated way for overcoming the latter and a summary of the responses of the participants in the workshops within the interventions that may provide some light into the role of paradigmatic concerns in practical applications.

The Three Systemic Interventions Employing Mixing Methods from Different Paradigms

The three interventions involved many stakeholders with diverse viewpoints. The interventions were conducted within the principles of critical systems thinking (se Jackson, 2000). A mix of methods from different paradigms was applied in each intervention. Some of the problems experienced during the interventions were unique from a systems point of view while some were common.

The **first intervention** *was about an analysis of management problems within a large software project* at an aluminium metal processing plant that undertook massive expansion and a significant modernization of its information systems. The project required a lot of expertise that was not readily available internally. The management chose the route of outsourcing. At a certain stage, the project slowed down and communication problems between the users and the developers emerged. That was when one of the authors got involved. A *framework for evaluation of the factors affecting software development productivity was developed* for this situation.

The framework helped to identify what made this project difficult to manage and how to address differences in the values of the stakeholders involved. The authors applied 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 Petkova and Roode, 1999; Petkova and Petkov, 2002). The mix of methods involved also rich pictures and CATWOE analysis; techniques from Soft Systems Methodology (SSM) by Checkland (see Checkland and Scholes, 1990). The importance of the factors affecting software development productivity was assessed via a Multi Criteria Decision Analysis (MCDA) modelling approach, the Analytic Hierarchy Process (AHP) (Saaty, 1990). It was used as a tool helping to interpret the importance of those factors and not in the traditional functionalist paradigm.

The case study showed that a possible strategy to improve the management of IT outsourced projects is to reduce the gap between the values of the developers and the clients. The intervention provided explanations for the delay that had been experienced in the project that previously were never discussed formally. As a result of the improved understanding of the environment of the software project it became necessary to reformulate part of the requirements for it. As a result the project could be continued and completed later on to the improved satisfaction of the client.

The **second case** *was about evaluation of rural telecommunications infrastructure*. The purpose was to provide a systemic evaluation framework for rural telecommunications infrastructure that will contribute to the body of knowledge related to holistic development of telecommunications in rural areas and of the related local economy as a whole. A case on the implementation of the framework in the Wembezi area near Estcourt, South Africa was used for its experimental validation (Nepal and Petkov, 2005). The first intervention workshop dealt with identifying the relevant stakeholders and defining their roles. The main purposes of the stakeholder analysis was to better address distributional and social impacts of projects, programs and policies; and to identify existing or potential conflicts, and factor appropriate mitigation strategies into activity design. A rich picture was used to initiate a brainstorming session. An analysis of the findings showed that the major issues in the improvement of rural telecommunications infrastructure were not only of technical nature but also included numerous softer issues (of cultural and political nature, along the lines of SSM Mode 2 (see Checkland and Scholes, 1999)).

The initial workshop included also *CATWOE analysis* of Soft Systems Methodology (Checkland and Scholes, 1999) and the *Boundary Judgment Questions of Critical Systems Heuristics* (Ulrich, 1998). Then the second workshop of the intervention included a multicriteria prioritization *of factors that affect the improvement of rural telecommunications infrastructure.* That involved an AHP group decision model which was applied differently for the way we used AHP in the first intervention as this time we used it as a hard systems approach within the original functionalist paradigm to which MCDA belongs. The last element of the evaluation process involved a questionnaire on the perceptions of the workshop participants about the methods and procedures that were used.

The **third case** was concerned with the *planning of the most appropriate telecommunications systems for a particular rural area in a developing country.* In

general, the successful design and deployment of telecommunications infrastructure does not depend solely on just technological imperatives, but is also affected by socio-economic, political, cultural, liberalisation, legislative, at least. The decisions involved in the deployment of telecommunications infrastructure are related to a very complex and messy problem. It is necessary to apply a holistic approach in order to obtain an effective solution; an effective solution being related to socio-economic and empowerment imperatives (Andrew and Petkov, 2003). The research produced a systemic planning framework for rural telecommunications in developing countries. The approach involved Interactive Planning (IP) (Ackoff, 1993) serving as the general framework of the intervention. Within the general process were applied a mix of rich pictures, stakeholder analysis, Interpretive Structural Modelling (Warfield, 1976) and Critical Systems Heuristics (Ulrich.1998). The framework was enhanced by the inclusion of current techniques from Systems Engineering and Telecommunications Engineering practice. A case study based on a rural area north of Durban in South Africa was used for the practical validation of the framework.

The soft techniques such as rich pictures enabled the engineers and the stakeholders to acquire multiple perspectives on the messy problem that they were faced with. Soft systems thinking methods further enabled the engineers to identify relevant systems that they would like to see in this particular area.

Further reflections on the experiences of the stakeholders in these interventions are provided in additional papers (see Petkova and Roode (1999), Andrew and Petkov (2003) and Nepal and Petkov (2005)) and are beyond the scope of this paper. The next section introduces a question whose answer is relevant for understanding the central issues for this paper.

Do We Deal Today With Paradigms Or Discourses?

As much debate in the literature on Systems Thinking over the last 20 years centres on paradigmatic concerns, it is essential at this point to define what a paradigm is. A *paradigm* is defined by Kuhn as "universally recognised scientific achievements that for a time provide model problems and solutions to a community of practitioners" (Kuhn, 1970).

Banville and Landry (1989) indicate that the term paradigm has been used with many different significations throughout Kuhn's writings and by his followers, but they conclude that a *paradigm determines the relevant research topics in a discipline, the appropriate research methods and the proper interpretation of results*. Burrell and Morgan (1979:23) consider that paradigms are defined by "meta-theoretical assumptions about the frame of reference, mode of theorising and modus operandi of the social theorists who operate within them. It is a term which is intended to emphasise the commonality of perspective which binds the work of a group of theorists …". Hirschheim and Klein (1989) define a paradigm as "the most fundamental set of assumptions adopted by a professional community that allows its members to share similar perceptions and

engage in commonly shared practices". The latter view is monistic and is in line with Kuhn's ideas of one reigning view during periods of "normal science".

Evaluating the contribution of Burrell and Morgan (1979) to the understanding of paradigms, Deetz (1996:203) concludes that, "Burrell and Morgan provided a great service by clearly expressing alternatives to the dominant 'functionalist' tradition. Many researchers are now claiming that before they missed much regarding the nature and effects of modern organizations, and insufficient attention was given to their numerous social and political functions".

According to Deetz (1996), *new dimensions of contrast between paradigms need to be defined* that correspond to the reasons for conflict between paradigms in the 1990s. Deetz suggests a new grid for classifying paradigms without defining new paradigms. It accepts that research differences are located in discursive moves and social relations rather than procedures and individuals. The first dimension of contrast between paradigms proposed by him focuses on the "origin of concepts and problem statements as part of the constitutive process of research. Differences among research orientations can be shown by contrasting 'local/emergent' research conceptions with 'elite/a priori' ones. The second dimension focuses on the relation of research practices to the dominant social discourses within the organization studied, the research community, and /or wider community. Research orientations can be contrasted in the extent to which they work within a dominant set of structurings of knowledge, social relations, and identities (a reproductive practice), called here a 'consensus discourse', and the extent to which they work to disrupt these structurings (a productive practice), called here 'dissensus discourse' (Deetz, 1996:195).

It has to be stressed that the grid proposed by Deetz (1996) defines four different discourses understood as "ways of articulating arguments and engaging in research practices rather than a means of reconstructive self-naming. Each discourse provides an orientation to organisations, a way of constituting people and events in them, and a way of reporting on them" (Deetz, 1996:198). They are considered by him not as paradigms because of the following three reasons: they are filled with internal conflict and strife; the edges are not demarcated; and lastly the discourses are not themselves sealed off from each other.

The characteristics of where and how research concepts arise (see Deetz, 1996) are of significance since they allow one to position postmodernism with respect to other research paradigms. Thus is avoided the need to explain postmodernism in a separate way from the rest of the paradigms in Burrell and Morgan's grid (see Jackson, 1993). This allows Jackson (2003) to adhere to the distinction between four paradigms as he calls them: the functionalist, the interpretive, the emancipatory and the postmodern paradigms quoting another publication co-authored by Deetz. However we feel that the original formulation of Deetz (1996) in terms of discourses provides more flexible opportunities for a better justification for the existing theories on addressing paradigm incommensurability as we shall see in the next section.

Justification Of Using Methods From Different Paradigms In The Same Intervention

Jackson (2003), in defining Critical Systems Practice, has moved away from the original idea of Total Systems Intervention (TSI) that paradigm incommensurability can be resolved by reference to some meta-theory (in the case of TSI version one (see Flood and Jackson, 1991) it was Habermas's Knowledge Constitutive Interests). Multimethodology, another contribution to pluralist systemic interventions, justifies work across paradigms on the basis of more recent ideas by Habermas - the theory of the three worlds: the material world, the social world and the personal world (Mingers, 1996:12). More recently Mingers (2001:248) claims that multimethodology, or critical pluralism as he calls it also, may be seen as a new paradigm which can encompass multiparadigm research combinations without taking the extant paradigm's assumptions at face value. On the other hand, the pragmatic pluralism approach is based on the assumption that we are witnessing the end of a particular reading of theory, that there is no single truth, no single rationality (White and Taket, 1996:54).

Recognising the fact that there is a certain justification for all of the above statements as they are taken from the point of view of those that formulated them, one can probably indicate that the only criterion for the correctness of a given viewpoint will be the future systems practice. It seems, however, that there is merit in the belief that Management Science will get the greatest benefit from pluralism as an approach to managing complex problems when it employs a mix of methods to take maximum advantage of the benefits to be gained from using methodologies premised upon alternative paradigms used together (Jackson, 2000). According to Jackson (2000) such coherent pluralism encourages the combined use of diverse methods, models, tools and techniques, in a theoretically informed way, to ensure maximum flexibility in an intervention.

Kuhn (1970) claims that the issue of paradigm choice can never be unequivocally settled by logic and experiment alone and to explain that, it is necessary to examine the nature of the differences that separate the proponents of a traditional paradigm from their revolutionary successors. Kuhn concludes that "differences between successive paradigms are both necessary and irreconcilable". This leads to the question whether one can use in the same intervention methods developed within the assumptions of different paradigms. Those opposing the idea base their opinion on the incommensurability of paradigms following Kuhn's argument.

The issue of paradigm incommensurability is still not resolved in the literature on pluralist systemic interventions in a unified way. A possible way out is suggested by Midgley (1997), and supported by Jackson (2000). It is based on an earlier work by Wendy Gregory regarding what is termed as discordant pluralism. According to that idea, the paradigm problem can be tackled by complementing our thinking about paradigms with a theory of how researchers from different backgrounds can learn from each other, but only in their own terms. The latter implies that communication between them, and hence between paradigms, is possible.

The systems literature does not mention another well thought-out argument about a possible explanation of communication between discourses within different paradigms which is presented by Hassard (1990). He builds his ideas on the basis of Wittgenstein's distinction between what he terms "the everyday language game" and other technical and special language games (Hassard, 1990:227). He concludes that "practitioners in different paradigms share ordinary language as well as much technical language. The latter is seen as the basis for training into future possibilities and …understanding of two language-games or paradigms…through recourse…to the everyday language–game holding ontological and epistemological primacy – the dialectic of nature and language" (Hassard,1990:230). This explanation seems very well justified given the general acceptance of Wittgenstein's philosophical ideas.

An interesting view on the issue of paradigm incommensurability is the idea of Deetz (1996) that the four discourses defined by him are not well formed with clear boundaries, and therefore cannot be considered paradigms. Under such conditions it is natural that different discourses may be in dialogue. It can be concluded that Deetz (1996) and both Midgley (1997), Jackson (2000) and Hassard (1990) support in their separate arguments the idea of certain forms of paradigm mediation and a combination of all these ideas can be accepted as a sufficient justification of the use of techniques from different methodologies based on different paradigms. Our understanding is that it is hard to decide whether one explanation is superior to another. At the same time it seems that ignoring any of those explanations limits unnecessarily our understanding of the role of paradigms in mixing methods. Hence we suggest that an integrative view derived as a result of a combination of all of the above arguments provides a complementary explanation of the issue of paradigm incommensurability in general. It resolves then what is defined as the main problem in a multimethodology intervention according to Mingers (1997:8) that is the legitimacy of transferring a technique developed within one paradigm to another. So far we have been dealing with theoretical issues justifying the issue of using methods from different paradigms. We tested our integrative approach to paradigm incommensurability in the frameworks of the cases of application of mixing methods in the three interventions discussed previously. The next section will deal with aspects of the practical validation of our approach and the perceptions of the stakeholders in the interventions about our use of methods from different paradigms.

On The Practical Validation Of Our Approach Involving Mixing Methods

The discussion on the practical validation of our mixing of methods in the three interventions will be structured around the specific work we did in the second intervention but the conclusions and the findings were informed by the results from all three cases.

Both the first and second case problems were addressed in a very similar way as action research interventions, following Checkland and Holwell (1998), Baskerville and Wood-Harper(1998), Stowell et al. (1997). The identification of the mess stage involved interpretive paradigm methods like stakeholder identification and assumption surfacing

from SAST, rich pictures and CATWOE analysis from SSM and also the boundary questions from Critical Systems Heuristics. The latter is classified as an emancipatory approach according to Jackson (2003) but according to its originator (see Ulrich, 1998), it is considered to be much broader and applicable also to problem situations fitting interpretive methods as well.

The first intervention involved the use of the Analytic Hierarchy Process (see Saaty, 1990) within an interpretive framework though the method originally was developed essentially as a functionalist approach. In the first intervention it was just contributing to gaining better understanding of the issues involved in that problem. Such interpretive role for MCDA is considered also by Keeney (1992) as one of the possible ways of applying MCDA in general.

In the second intervention, aiming at identifying the complexities related to evaluation of rural telecommunications infrastructure, we applied again a multi-criteria decision making approach, this time for prioritizing the factors affecting the improvement of rural telecommunications infrastructure and for examining the impact the improvement of rural telecommunications infrastructure will have on the socio-economic development of the local area. The way how we used the AHP models in this case was purely within the functionalist paradigm. This provided us with some observations over the practical implications of the perceived issue of paradigm incommensurability and how it impacts in practice the stakeholders in an intervention.

The workshop participants in the second intervention defined the possible impacts of telecommunications on development as follows: Social networking, reduction in travel time, improvement security, improvement education, improvement local government, improvement health, and creation of employment opportunities. Following the AHP approach, pair-wise comparisons with respect to the main goal: Impact of Telecommunication Infrastructure on Socio-economic development, were provided.

According to the synthesized global priorities, the improvement of rural telecommunications infrastructure will impact mostly on the creation of employment opportunities. Good rural telecommunications infrastructure can also help to improve the situation of saving lives by providing coordination links between the different health sectors and emergency services. It can encourage the use of telemedicine. Similarly it can assist the education sector by providing facilities for distance learning and internet services. Local government can also benefit from good telecommunication infrastructure. At the time of the intervention, they lacked the facilities to take advantage of teleconferencing. The stakeholder representatives also indicated that in most cases they would like to meet people face-to-face for social networking, especially those that are living in the same area.

The practical aspects of paradigm incommensurability were analysed on the basis of answers to a *post session questionnaire on the participants' satisfaction* with respect to:

- the approach followed for the evaluation of rural telecommunications infrastructure,
- importance and relevance to the problem under concern, and
- aptness of the techniques used for the evaluation of rural telecommunications infrastructure.

The questionnaire was prepared in line with an instrument suggested in DeSanctis et al. (1990) with respect to Group Decision Support Systems (GDSS) research. The feedback helped to validate the framework used for the evaluation of rural telecommunications infrastructure. The responses of the participants were expressed through a 5-point scale in which 5 meant maximum satisfaction or importance.

The results can be summarised as reflecting a very positive attitude as the means of 9 out 10 questions exceeded 3.5 on the 5-point scale and in 3 out 10 they exceeded 4.

The most frequent answer to the first question: *Did you find this workshop useful?* was defined as "To a very great extent", the mean value being 3.91. To the second question: *Do you have after the workshop a better appreciation of the link between rural telecommunications and rural development?* the responses indicate again an agreement.

An analysis of the results for the third question: *Do you think the approach used in the workshop helped you to gain a better understanding of the problems associated with rural development?* show again a very positive response. Similar response was given to question four in that the participants felt that *the time spent on the workshop* was sufficient to understand the basic problems associated with rural development.

Three questions were related to aspects of the techniques applied in the workshop. Understandably, given the lack of formal training in these techniques, the most common answer to question five: *Did you find the techniques **used** in this framework (e.g., Stakeholder analysis, CATWOE analysis, etc.) easy to follow?* was "to some extent". However, the level of user satisfaction in question six: *Do you think the classification of the issues and the development of the hierarchy made the prioritization process easier?* was high as the mean of the answers exceeded 4. While a certain method may have seemed a bit unusual to some, as a whole the complementary use of all the methods provided a multifaceted and diverse mental model to the stakeholders involved. In summary, the answers of the questionnaire demonstrated satisfaction with the approach and acceptance of the techniques used and also the results.

It was interesting to point that the participants in the second workshop were very positive about the use of AHP models as a way to define how important are the issues related to rural telecommunications infrastructure. A similar positive opinion was expressed in the post workshop evaluations about the role of AHP as an interpretive tool for defining the values of the clients and the outsourcing provides in the first intervention. We judge that that application of AHP was mostly used as an interpretive tool as we applied it separately with the groups of stakeholders and the resulting differences in their viewpoints informed further the debate. In the second and third intervention the

prioritization was conducted by consensus by the whole group of stakeholders. It was just an expression of what the perceived importance of the various elements of telecommunications infrastructure is. However one needs to recognise the fact that the differences in which the AHP method was applied were strictly understood only by us as facilitators of the interventions. In our opinion it was not felt by the stakeholders in any of the three interventions who just appreciated the opportunity to apply an additional method to those from soft systems thinking that allows them to measure their beliefs about important issues in the respective intervention.

The reflections of the participants on the intervention showed that some of the questions that we used when applying SSM and CSH need to be further contextualised and simplified. The process of application of the evaluation framework might need further refinement after similar evaluations to reflect the need to keep the attention of the participants in the workshops and avoid them being overloaded with new information regarding the evaluation process itself.

It can be claimed that the crucial element for success of the three interventions was the skill with which the facilitators applied the methods involved. Each intervention was facilitated by one of the authors and another member of our group was serving as an assistant or a scribe. During each intervention the results from a particular method were seamlessly used as inputs to the next method applied and thus we strived to apply Jackson's (2000) idea for a conversation of the methods within the intervention which was not managed from above, from a meta level. Hence while we adhered to the paradigmatic principles embedded within a given method when applying it, we could guide the stakeholders at each stage to the use of the subsequent method (usually from another paradigm), taking the results from the previous stages as inputs. This is the main practical difficulty in applying a multimethodology approach in our opinion which can be overcome through better competency and experience of the facilitator.

Conclusion

The paper provided a brief overview of what is known theoretically on the issue of paradigm incommensurability and on ways for its resolution. We proposed an integrative approach to address it. Our findings were supported by observations on the practical application of mixing methods from different paradigms in the same intervention through our involvement in three different cases related to complex problems in the Information and Communication Technologies Sector in South Africa.

We discussed the existing views on an open problem of pluralist systemic intervention theory: lack of uniform understanding in the literature on whether work across paradigms represents some kind of a meta paradigm or whether it belongs to a completely new paradigm itself or as a third alternative, should it be grounded within the theory of existing paradigms.

Our understanding of those issues was informed by the developments in Critical Systems Thinking in the past decade and was applied to three interventions in rural telecommunications and software development. They involved mixing of techniques from several soft systems approaches and multi-criteria decision analysis.

Another issue that requires additional investigation is their use within different paradigms from those for which they were created originally. Our practical work with AHP showed that this is possible. It is supported also by prominent authors in the MCDA field like Keeney (1992) but is generally not accepted by Jackson (2003).

We justified mixing of methods using the theory of the three worlds by Habermas (1984). Our work was influenced by the Multimethodology ideas of Mingers (1997) and those on Critical Systems Practice by Jackson (2000). Our practical experience in the three cases of concern confirmed also our theoretical findings on the feasibility of mixing methods in the same intervention and showed that it is possible to implement the interventions in a way that enables a conversation between the methods involved within the intervention and not from above. Further practical work is needed however along similar lines in order to confirm our exploratory findings and improve the overall understanding of paradigm issues when applying pluralist ideas in systemic interventions.

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