Are Concepts from Post-Normal Science Applicable to the Evaluation of Collocated Collaborative Processes?

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Vision and Experience and Challenges

This is just a very informal and brief discussion of the post normal science paradigm, noting interesting parallels to the challenges we face in developing functional evaluation processes for collaborative practices. Though this discussion is applicable to most collaborative and in fact most social processes, I will largely discuss it in terms of small group of co-located (in time and place) collaborators. As I start to explore these concepts I have discovered that while they are fairly new to me, over the last ten years they have become increasingly common in environmental studies, assessments and policy making.

It is probably best to start with some definitions and a discussion of these definitions. If we are going to talk about ‘post normal science, what then is normal science? In these terms normal science evolves through a rigorous process of thesis and hypothesis development, experimental evaluation and careful observations. Done with sufficient thoroughness, this process can arrive at facts about which we can be relatively certain.

The idea of post normal science arose in environmental studies where scientists were put in the untenable situation of having to evaluate very complex systems and arrive at facts upon which management and governments could make decisions and set policies. Faced with being required to make far reaching decisions on inadequate or uncertain facts Funtowicz and Ravetz (1990) suggested opening the process up by making use of extended peer review and public participation. They called this approach post normal science.

Post normal science methodologies have been developed to help us improve our understandings of complex systems. Intuitively we can say the collaborations between people are complex systems. However, examining the properties of complex systems is interesting in shedding light on small group collaborations. The following list is taken, with some minor adjustments, from McCarthy 2004, which in turn references Kay et. al 1999.

Properties of Complex Systems

1. **Non-Linear:** Behaviour comes from the whole. System can not be understood by decomposing it into its component parts which are then reunited in some definitive way (addition, multiplication).
2. **Nested:** Balance between internal or self control and external or shared control. The balance is required for operation.

3. **Internal causality:** non-Newtonian, not a mechanism, but rather is self-organizing. Characterized by goals, positive and negative feedback, autocatalysis, emergent properties and surprise.
4. **Window of vitality:** must have enough complexity but not too much. There is a range within which self-organization can occur. Complex systems strive for optimum, not minimum or maximum.
5. **Dynamically stable:** there may not exist equilibrium points for the system.
6. **Multiple steady states:** there is not necessarily a unique preferred system state in a given situation.
7. **Catastrophic behaviour:** this is almost the norm,
    a. Bifurcations – moments of unpredictable behaviour.
    b. Flips – sudden discontinuity.
8. **Chaotic behaviour:** limited ability to predict – no matter how good our information or how sophisticated our assessments and analysis.

These characteristics of complex systems can readily be used to describe co-located collaborations. In themselves they make a fairly eloquent statement about how difficult it is to apply the practices of 'normal' science to the study of face-to-face. Anyone trying to comprehend the working of a complex system may well be bewildered by the number, variety and complication of interlocking processes.

The application of normal scientific processes will to try to reduce the overall complexity by fine tuning particular questions or hypotheses, using these hypotheses to allow one to cull some of the complexity by trying to eliminate as many of the extraneous variable as possible (Figure 1).

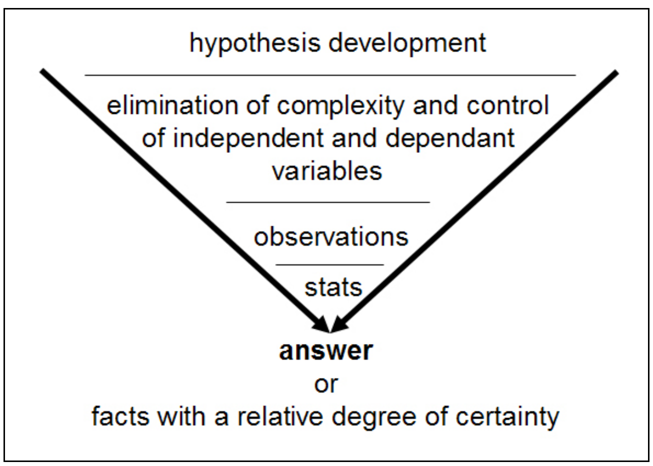

Figure 1: a simple schematic of the normal scientific experimental process

This idea that we observe of simpler, more manageable subsets of the full complex process is appealing and it is clear from experimental psychology that much can be learnt in this manner. However, since our gaol is to support the collaboration in its full complexity this normal science approach has limitations. In fact, researchers are starting to be able to point to factors that they know have effect conflicting effects on, for instance, dynamic behaviour. That is, not everything that is good for individuals in the group will be good for the group as a whole. The complexity of the whole system interferes with the effectiveness this approach for our purposes.

There are already instances of research in this community that parallel the environmental post normal science approach of involving stake holders. In fact, the well known practices of participatory design almost directly parallel some post normal science practices. There are also an increasing number of what we call observational studies (Kruger et al. 2003) that fit well into this paradigm. Figure 2 shows a simple schematic diagram of this type of process. What makes this post normal is that definitive answers are not arrived at. Instead the resulting increased understandings lead to new insights and sometimes new questions that can re-frame the research direction.

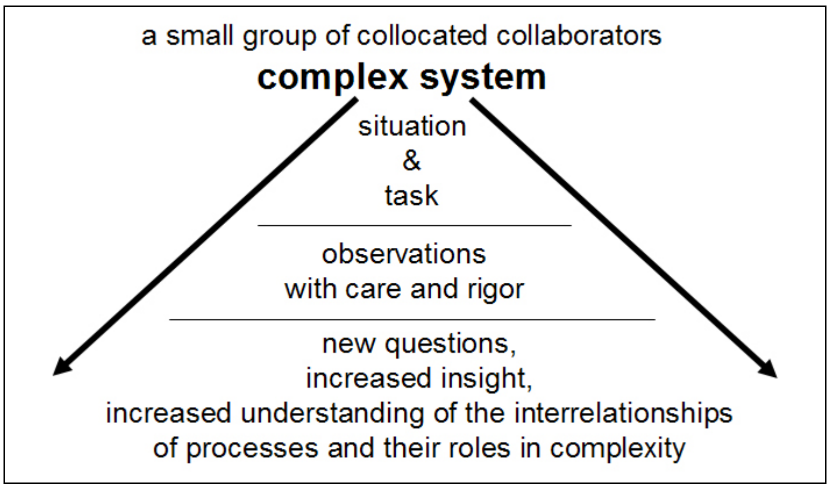

Figure 2: a schematic of a post normal scientific process. Note how the results are relatively 'soft' facts but can lead to greater understandings.

The post normal science ideas do not provide us with a complete answer to our needs to develop evaluative procedures. They can however, contribute a frame work for that begins to describe the complexity in the systems we are studying and a recognition of the importance of more expansive experimental process.

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Workshop Goals: I have presented these ideas because I would very much like to discuss them with the collocated collaboration research community. I think that there are some interesting ideas in post normal science that we as a group may be able to make sense of, for our own practices. A discussion with informed practitioners would be good.

Bio: Sheelagh Carpendale is an Associate Professor at the University of Calgary, in Calgary, Alberta, Canada. She holds a Canada Research Chair in Information Visualization, jointly between the Department of Computer Science, Faculty of Science and the Faculty of Communications and Culture. Her research interests in information visualization have expanded to include collocated collaboration. This is because when the effort is made to visualize information it is nearly always done to show to other people. That is, it is intended to support such things as research collaboration, management decisions, and evidence-based diagnostic processes. Support of these types of tasks has naturally led to a need for computational support for small group collaborations. She has focused on larger screens such as tabletops and walls to provide sufficient space for several people to do information manipulation and exploration tasks. Sheelagh has been involved with the organization of previous workshops at CSCW 2002 and Ubicomp 2002.

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