Systemic environmental decision making: designing learning systems

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Paper type: Case Study

Purpose of this paper

This paper was written for a special issue of Kybernetes devoted to cybernetics and design. The case studies are both informed by cybernetic and systems thinking and constitute a form of second-order design praxis.

Design/methodology/approach

The case studies exemplify reflective practice as well as reporting outcomes, in terms of new understandings, from an action research process.

Findings

We show what was involved in course design from a cybernetic perspective to effect systemic environmental decision making as well as developing and enacting a model for doing systemic inquiry which enabled situation improving actions to be realised in a complex, organisational setting. We lay out the theoretical and ethical case for understanding forsr and second-order designing as a duality rather than a dualism.

Research limitations/implications (if applicable)

There is a danger that readers from an alternative epistemological position will judge the paper in terms of knowledge claims relevant only to their own epistemological position.

Practical implications (if applicable)

The main outcomes suggested by this paper concern the possibility of transforming the current mainstram identity of educators project managers and researchers to a position that offers more choices through both epistemological awareness (and pluralism) and the design of learning systems, including systemic inquiry, as second-order devices.

What is original/value of paper

The case studies are based on both novel settings and theories in action; the concept of the learning systems as both a design and systemic practice as well as an epistemological device is novel. The paper is potentially of relevance to any practitioner wishing to use systems or cybernetic thinking. It is likely to be of particular relevance to education policy makers and public sector governance.

Abstract

Informed by first and second-order cybernetic understandings the case is made for the design of learning systems as a socially relevant form of praxis for situations of complexity, uncertainty and conflict. Two case studies of designing are considered. In the first, students of two versions of the Open University course ‘Environmental decision making: a systems approach’ use a ‘learning system’ heuristic designed to encourage them to start off systemically in environmental decision making (EDM). They do this by exploring decision-making situations before formulating problems, opportunities and systems of interest in situations of complexity. Learning from the design of learning systems for students can inform research practice. In the second case a systemic approach for managing water through social learning based on the design of a systemic inquiry is described. Drawing from these examples the authors explore the cybernetic and systemic nature of their design praxis making the case for first and second-order designing as well as systemic and systematic practice to be treated as a duality rather than a dualism

Keywords: second-order research; learning; environmental decision making; systemic inquiry; design practice, water framework directive.

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1.History and context

This paper is about the design of learning systems for starting out systemically in environmental decision making (EDM) and the extent to which these learning systems reflect cybernetic traditions of understanding on the part of the designers. By EDM we mean including environmental considerations alongside other factors in decision making. By environment we mean that which surrounds, affects and is affected by an entity, whether group or individual (Blackmore 2005). We use two case studies: one from our scholarship associated with pedagogy at the UK Open University (OU) (Blackmore and Morris 2001; Open University 2006) and one from research funded by the Environment Agency (EA) of England and Wales as a systemic inquiry into employing social learning for river basin planning, part of the EA's responsibility in implementing the European Water Framework Directive (WFD; Collins, Ison and Blackmore 2005).

Both cases are a product of our history and context in which practices not always common to other university settings are needed. For example, an OU course has traditionally been developed by a multidisciplinary project team costing from £250,000 to over £1 million to produce. Each 'course project' is a good example of applied R&D (Ison and Russell, 2000), even though many of the design parameters are preordained. This requires team work and project management skills. The OU is a significant innovation in UK higher education and has pioneered open entry and supported open learning by creating a unique learning experience that combines high quality with low unit cost (Daniel 1996). Moreover, it has demonstrated that open learning is popular with adults. It is the UK's largest university with over 200,000 learners; since 1971 it has taught over two million people of whom 325,000 have gained a degree. Currently 27% of all UK part-time higher education students study with the OU. Provision of distance-taught post-graduate courses and PhD provision (in a traditional mode) have expanded since the OU was established. Although not yet a common view it can be argued that OU academics are designers and developers of 'learning systems' rather than simply

producers of courses (Ison 2000). Our praxis continues to evolve under joint pressures of competition from other providers and new technologies for delivery of material and mediation of learning.

Just as the Open University has embodied changing conceptualisations of learning systems so similar opportunities arise in many public policy contexts. The European WFD is innovative legislation which changes fundamentally the historical basis for managing water (Kaika 2003). It is now the ecological status of water that is managed in a series of three cycles over 27 years, rather than the chemical or physical quality of water accompanied by engineered structures. As we argue elsewhere, just what constitutes good ecological status cannot be known objectively so water and river catchment, or basin, management becomes an arena for a performance between multiple stakeholders, i.e. a design setting characterised by multiple feedback processes and emergence with no simple means of control (SLIM 2004a).

We explore how starting off systemically in EDM was conceptualised and the extent to which our concern for the design of 'learning systems' (Ison 1994, 2000; Ison and Russell 2000a; Blackmore 2005) has enabled new insights and practices to emerge. We conclude by examining how re-thinking roles as designers of 'learning systems' and situations as if they were 'learning systems' can enhance systemic environmental decision-making and facilitate social learning (SL).

1.1. Traditions of understanding

It is difficult enough in a multi-authored paper, let alone a whole special issue, to take responsibility for articulating the different traditions of understanding out of which we each think and act (Russell and Ison 2000). Because of our own unique histories our different traditions are inescapable so we must make do with our situation of being human – of living in language and being capable of engaging in coordinated action, a form of performance. Recognising this we can, however, take responsibility for articulating the intellectual lineages which inform our explanations and practice, recognising that this will never be a full accounting.

Figure 1 is a depiction of the influences that shape contemporary systems approaches showing the historical lineages to General Systems Theory, cybernetics (first and second-order), operations research, complexity science and so on. The main point of Figure 1 is to convey the notion that when we engage with systems or cybernetic thinking and practice we conserve a lineage, and as argued by Ison (2008), it is the connections we make with this history as part of our unfolding social relations that determine, or not, whether we can claim to be using, or drawing on, systems or cybernetic thinking. The social relations associated with preparing this paper and the special issue testify to this; as Ceruti (1994) observes, ‘one does not belong to a particular tradition, one produces it’ (p. 6).

Being aware of the different systems and cybernetic lineages, the praxes that have evolved, their constituent concepts and the techniques, tools and methods that are used are all embraced in these social relations and are available for ‘designing’ by a systems practitioner. As authors we have engaged with some, or all, of these lineages from original academic backgrounds in agricultural science, environmental science and geography.

Our engagement with design lineages is more limited. Ison (1993) argued, following Coyne and Snodgrass (1991), that design can be characterized as an involvement in a project that has many players and that translates human culture, technology and aspiration into form. This concern for design grew from recognition that the future form of Australia’s semi-arid rangelands was more a question of design than the application of rationalistic planning or science. This design focus was in part a response to Hooker's (1991) observation that: "The direct consequence of the profound changes in the character and role of organised knowledge is that the future must now be regarded as increasingly a human artifact - an art-in-fact. The future can no longer be regarded as a natural object, a fact already there or objectively determined by present trends. Rather it must be chosen.” In recent years our primary vehicle for enacting this understanding of design has been through designing and developing ‘learning systems’, including

curricula, and constituent courses, for the education of the 'systems practitioner' (Ison 2001; Blackmore and Morris 2001). Our conception of 'learning system' is discussed below.

We see it as important to give a partial accounting of ourselves because our perspective is that the designer can never be absent from the design setting. For this reason it seems important to strive to be responsible for the traditions of understanding out of which we think and act. A common concern we now have is how to create (design) the circumstances for systems practice in situations of complexity, uncertainty, connectedness, conflict and multiple perspectives (SLIM 2004a). In such situations we are particularly concerned with developing competence for systemic environmental decision making, including managing for emergence. It is a particular type of emergence, experienced as concerted action among multiple stakeholders, which we call social learning (Ison, Röling and Watson 2007; Blackmore 2007; Collins et al 2007).

1.2 First and second-order design

For Blackmore (2005) a learning system comprises interconnected subsystems, made up of elements and processes that combine for the purpose of learning. The placement of a boundary around this system depends on both perspective and detailed purpose. From a first-order perspective the design of a learning system might seemingly involve combining elements and processes in some interconnected way as well as specifying some boundary conditions – what is in, what is out – for the purposes of learning. The specification of learning outcomes in the absence of any real contextual understanding about learners predisposes, or restricts, most course design to this approach. But in claiming that appreciative systems (*sensu* Vickers e.g., 1983) are learning systems Blackmore (2005) is suggesting something more organic and observer dependent, viz: let us consider this situation as if it were a learning system, or, in Vickers' terms. 'I have found it useful to think of my life's work in terms of appreciative systems'. With this shift we see a 'learning system' move from having a clear ontological status (e.g. this course) to becoming an epistemic device, a way of knowing and doing (*sensu* Maturana – see Maturana and Poerksen 2004).

Reflecting this turn, Ison and Russell (2000) suggest it is a first-order logic that makes it possible to speak about, and act purposefully to design or model a 'learning system'. A second-order logic appreciates the limitations of the first-order position and leads to the claim that a ‘learning system’ exists when it has been experienced through participation in the activities in which the thinking and techniques of the design or model are enacted and embodied. An implication of this logic is that a ‘learning system’ can only ever be said to exist after its enactment - that is on reflection. The second-order perspective is not a negation of the first – they can be understood as a duality. This first to second-order shift also enables a more effective engagement with the difficult concept of ‘learning’.

When learning is referred to it is usually without the theoretical background that would enable a reader or listener to know on what ground learning might be claimed (Ison et al. 2000; Blackmore 2005). There are many theories of learning (Blackmore 2007); our preference is those theories that constitute a social theory of learning (*sensu* Wenger, 1998) where 'learning is practice'. Within this second-order perspective Reyes and Zarama (1998) describe their concern with the design of learning systems that move beyond the capacity of a learner to repeat a distinction (first order learning) to one in which they appropriate or embody it, and thus understand it. From their perspective the meaning of a distinction is in the actions it allows us to make i.e., the distinction can be brought forth as part of a learner’s tradition of understanding. As designers of learning systems this has been our aspiration. Fortunately the OU in general, and the Systems Group in particular, have historically developed courses using an active pedagogy in which the design requires concepts, tools, techniques and methods to be grounded in the lifeworld of the student. The challenge for the designer, particularly in the distance teaching setting of the OU is, however, challenging, especially if one accepts the claim that ‘pupils learn teachers’, i.e. teachers do not transmit content but acquaint their pupils with a way of living (Maturana and Poerksen 2004, p.128). There are also constraints to the extent to which we can learn from our students’ learning in effecting new designs; in part this is structural as the OU slowly transforms itself through phases that Ison (2002)

has characterized as the (i) linear, one-way, delivery phase (1969-1996) and (ii) two-way feedback phase (1989 - ?) to some yet to be realised future.

A particular challenge in 'learning system' design for educating the systems practitioner (including systemic environmental decision maker) is the extent to which there is congruence between the doings of the project team and the doings that students are invited to participate in when they do an OU course, or in the case of fellow inquirers, engage in a systemic inquiry. One way of illuminating this is to consider the practice settings of the designers and the practice setting of the students or inquirers. Doing so reveals the tensions between first and second-order designing.

Designing, as with systems practice, or systemic EDM is a practice setting. First-order designing is synonymous with first-order cybernetic understandings, in which goal seeking behaviour is the norm, control is considered possible and designs have a blueprint quality. This parallels systematic (or goal seeking 'hard systems' *sensu* Checkland 1999), rather than systemic practice. Second-order designing arises when the designer acts with awareness that they and their history are part of the design setting. First-order design delivers an output, second-order design delivers a performance. In the second-order case it is understood that each practice setting has (i) a context in which a performance is enacted; (ii) a person or persons – the practitioner(s) and (iii) tools, techniques, methods, methodologies etc. There is also a fourth aspect which is not so apparent – each element has a history which can be explored and understood. There is always a history of the context, the practitioners (each is a unique individual and thinks and acts differently even though they may come from similar cultures) and the tools, techniques etc (these in particular become institutionalised and create the norms and 'rules of the game' in particular settings). There is also a history of performing in a particular way – what is recognised as good practice in one setting may not be the same in another setting. The systemic connections between these elements are important if a performance that is effective is to ultimately emerge. These factors apply to our own practice settings and also to that of a student at a distance. In the latter case the pedagogy and other elements of the

practice setting can trigger a first-order response (utilitarian or instrumental learning), or a second-order response – an ability to make the material their own and orchestrate their own evolving praxis.

In our own practice we distinguish between systemic and systematic practice arguing that historically these have been treated as either/or, a dualism, rather than a duality. The same understanding can be applied to first and second-order-designing, or first and second-order R&D (Russell and Ison 2000). Having explored aspects of our context we now address our two case studies.

2. Case 1 (1996-2007): Environmental Decision Making. A systems approach (T860 and T863).

This case concerns a core course in the OU's postgraduate programme in Environmental Decision Making (see http://edm.open.ac.uk). The course was first presented in 1997 (course code T860) and was replaced by a revised and updated new course (code T863) with the same title in 2006. Both courses are 30 points, where 1 point is equivalent to about 10 hours of study; all courses are presented (i.e., able to be studied) twice a year beginning in either May or November, each presentation being over 23 weeks. After successfully studying 120 points (usually four courses, of which two are core and compulsory) students can claim a Postgraduate Diploma in EDM; with a further 60 point research course they can gain an MSc in EDM.

Conceptualisation of T860 was driven by several concerns: (i) the experience that many mainstream approaches to environmental management were taught and practiced instrumentally (built on a commitment to technical rationality) and (ii) that environmental management connoted a particular form of professional. In contrast we considered everyone was, or soon would be, involved in EDM – hence a generic competence. Our approach was to move beyond the common conception of environment to take a systemic perspective encompassing, but at the same time transcending, the notion that the environment was just the biophysical world. In systemic practice systems of interest are formulated by someone as heuristic, or epistemological, devices, for learning about

situations of complexity and uncertainty and in which there are multiple perspectives on what is at stake. When someone (an individual or group) formulates a system of interest they distinguish a system from an environment and make boundary judgements i.e. they distinguish a series of relationships – system-subsystem-environment-boundary.

Our experiences were that much EDM was non-systemic with emergent, unintended consequences (e.g. transport policy in the UK and road building in particular). The original T860 course started with a case study of the UK Twyford Down motorway development decision-making process, thereby providing students with a common experience of what Ackoff (1974) describes as a 'mess'. We were also mindful of claims such as the President's Council on Sustainable Development (USA; 1996) that: '*The principles underlying education for sustainability include, but are not limited to, strong core academics, understanding the relationships between disciplines* [and] *systems thinking…..'*. Students were introduced to a range of systems diagramming techniques to engage with the case study. These involve making boundary judgements (systems maps) exploring causality and influence (multiple cause, influence and sign diagrams) and revealing multiple perspectives (rich pictures; metaphors) for exploring the context of environmental issues and formulating problems and opportunities (Figure 2).

Insert Figure 2 about here)

In conception we were mindful that initial starting conditions determine the phase trajectory of any process, including a decision-making process. Our desire was to create capacity to start off systemically in EDM. Our pedagogic approach was to develop a theory-informed EDM framework (Figure 2) which (i) structured the course and the student's own project (the framework became a design heuristic for the layout and organisation of the course materials and for the continuous assessment through TMAs (Tutor Marked Assignments) and a project of the students own choosing (as the end of course assessment); (ii) provided a tool or heuristic device for students to analyse and evaluate environmental decision-making situations and (iii) made explicit links with EDM as a form of systemic action research (AR) and experiential learning which students

could build into their own praxis (i.e., Figure 1 is not dissimilar from a cycle of explore, plan decide, act common to some AR models).

Using the Twyford Down case study students' starting point was to explore the context of issues, recognising that how something became 'at issue' was socially constructed and highly sensitive to who participated in the process. We argued that this stage preceded the formulation of problems and opportunities (Figure 2). In this model the process of formulating systems of interest was introduced as a way of formulating problems and opportunities. Starting out systemically, we argued, came from an appreciation that when confronted by a common situation, individuals are likely to recognize different 'systems of interest' because they have different perspectives associated with our unique experiential history.. From this unique cognitive history it follows that all we have at our disposal is the ability to communicate about our experiences: we never have exactly the same experience.

We introduced 'perspective' in a particular way. The Greek origins of the word mean 'to see or regard'. But what does it mean to see or regard? An explanation would be 'a way of experiencing which is shaped by our personal and social histories' where experiencing is a cognitive act, an explanation coming from the biology of cognition. 'Cognition' derives from the Latin *cognoscere*, or literally 'together to know'; i.e. cognition arises in interactions between a living system and its environment, it is not something that just happens in the brain (Capra and Flatau, 1996). In the second-order cybernetic Santiago theory of cognition structural changes triggered in a living system (e.g. a person) during their recurrent interactions with their environment are associated with cognitive acts (involving language, emotions and perception), and thus development is always associated with learning; development and learning are recognized as two sides of the same coin. The act of formulating systems of interest, especially as aided by systems diagramming, brings forth new distinctions (perceptions), mediates conversations and potentially enables emotional issues to be publicly expressed.

In OU terms T860 has been successful; since first presentation 1398 students registered, 1122 completed, an 80% completion rate, and of those completing pass rates have been very good. Student feedback in formal course evaluations has been positive and the course has had impacts via students in other organisational and policy settings. It is worth noting that in a European context (although not in the developing world), where most of our students come from, the course was experienced by (mature age) students as both innovative and challenging – it preceded the EU's Aarhus Convention and the now more widespread discourse about stakeholder participation in environmental decision making and recent concerns about the role of science (Wilsden et al. 2005).

By 2003 many of the innovative features of T860, particularly those concerning the shift from consultative to participative approaches, had begun to be mainstreamed within Europe (e.g. EU 2003). Some students were critical of the courses systemic focus rather than what they considered pragmatic practicality and there were some who felt that power and economics were not treated as much as they should. Along with many OU courses the amount of material available for the learner was also an issue i.e., this added to complexity. To remain professionally and socially relevant a replacement course had to reflect these changes (Open University 2006).

Historically there has been a considerable lag between initiating and presenting a new OU course; in the case of the T860 replacement we started in 2003 for a presentation in 2006. Over the period from 1996 our own understandings (or appreciative settings – Blackmore 2005) had also changed through our own practices in scholarship and research (e.g. SLIM 2004a) and through feedback on student experience in T860 and other courses. A pedagogic challenge of all contemporary systems teaching is to create the circumstances for epistemological affirmation or shift in the learner (Salner, 1986). This involves the move from seeing systems as ‘real’ (i.e. having some ontological status) to seeing ‘systems’ as epistemological devices for learning about situations of complexity (i.e. ‘messes’) with a view to changing or improving (transforming) them.

Through experience we had recognised that it was a trap to assume that new students were, or were not, systems thinkers and epistemologically aware, or not. Our experience is that for many people systems thinking (ST) is intrinsic though the conceptual language may be missing. We thus start our new course (T863) by attempting to foster a student's systemic awareness grounded in their own experience. Systemic awareness comes from understanding: (i) 'cycles', e.g. between life and death, various nutrient cycles and the water cycle; (ii) counterintuitive effects, and (iii) unintended consequences. Unintended consequences are not knowable in advance but thinking about things systemically can often minimise them.

A focus of the new course is a core set of understandings and skills associated with systems thinking, modelling, evaluating and negotiating. The course text, comprising four books is supported by the development of a separate Techniques Book and a course DVD. The new course heuristic explicitly operates at two conceptual levels and is designed to provide students with the experience of moving between different levels of abstraction (Figure 3). In T863 there are four main course books:

- Book 1 Introducing environmental decision making
- Book 2 Starting off systemically in environmental decision making
- Book 3 Making environmental decisions and learning from them
- Book 4 Critical appraisal in environmental decision making

Book 1 introduces the concept of environmental decision making, includes a major case study on aviation expansion and introduces the T863 framework. Pedagogically it sets out to value student prior experience as well as providing a common experience through engagement with the case study. Book 2 discusses the first two stages of the framework, 'Explore or re-explore the situation' and 'Formulate problems, opportunities and systems of interest'. Book 3 covers the third and fourth stages, 'Identify feasible and desirable changes' and 'Take actions'. Book 4 reviews the whole framework and the wider context of environmental decision making. Figure 3 shows how the four main course books relate to the T863 framework and how the framework not only describes the stages of a decision-making process but also provides the structure to the course itself.

Our aspirations as designers are in part captured by the expectations we have of students for their end of course assessment (Table 1) which accounts for 50% of their marks. Conceptually a major aim has been to produce a course able to build capability for systemic EDM as a form of praxis. One ingredient of this, based on our own research, has been to enable a move from participation to SL as a more meaningful policy and governance strategy in EDM situations (see SLIM 2004ab). As outlined in Table 1, students are expected to engage with and use the framework critically and to avoid using it systematically (i.e. in a linear, step-by-step way in which assumptions about the problem/opportunity are reached too quickly or from a limited range of perspectives). This was also a requirement of T860, but we soon realised that students were asked to do this but the course did not cover how to do it. Book 4 in the new course is designed to remedy this situation. It operates at a higher level of abstraction providing both a critique as well as the means to engage in critical thinking. We also recognised that the T860 framework predisposed students towards divergent thinking at the expense of convergent thinking so in T863 we tried to take more account of the convergent stages of weighing up feasible and desirable changes and negotiation (Figure 3).

Like any framework, the T863 EDM framework has potential strengths and limitations, depending on how it is used. Strengths are that it recognises the following needs: (i) for problems, opportunities and systems of interest to emerge from exploring or re-exploring a situation; (ii) to use techniques and develop skills and understanding for EDM; (iii) for EDM to be considered as an iterative rather than a linear process. The framework can also be used to help question and consider decision-making processes. For example, the teaching supporting the framework explores questions such as: Has the situation been considered sufficiently? Have problems, opportunities and systems of interest been allowed to emerge? Will systems thinking, modelling, evaluating and negotiating help? Who has been involved in the processes of exploring a situation, formulating problems, opportunities and systems of interest, identifying changes and taking action and how have they been involved? What have we learnt from the overall process and

how can that learning inform future decisions and actions? The framework's limitations (which it shares with other frameworks) are that it will not be possible to 'fit' every decision-making process to it and all steps in it will not be appropriate for all situations.

3. Case 2. A systemic inquiry into social learning for river basin planning

This project drew on understandings from our course developments as well as other research (SLIM 2004a). It was initiated following growing frustration with existing project management and decision making techniques among a policy and practice community in the Environment Agency (EA) – the environmental regulatory authority in England and Wales, a public sector statutory organization with *c*. 10,000 employees. The team responsible for developing the River Basin Planning Strategy (RBP) for implementing the WFD in England and Wales had become trapped in a cycle of systematic project management using the PRINCE2 methods in an attempt to build an integrated approach to RBP. We found that the approach based on PRINCE2 was clearly unable to deal with the complexity, especially the adaptive learning, that was needed in the situation, something recognised in similar situations by Winter and Checkland (2003). In desperation, the authors were asked to help the RBP team develop a learning approach to RBP.

From this request, a series of discussions and preliminary workshops with the team took place to make sense of the situation and establish the main components or themes of a learning system to do RBP. The project was agreed to comprise a high level systemic inquiry (SI) with a number of constituent inquiries used to progress: (i) learning about the benefits and risks of SL, especially in supporting more effective River Basin Planning (RBP); (ii) developing a conceptual framing for, and stakeholding in, a 'Programme of Measures' project, as required to implement the WFD, and from which systematic project management could proceed, having been systemically situated; (iii) exploring how a new approach to RBP could be incorporated into the traditional 'business' of the EA and (iv) learning how SL could be extended to the engagement between EA staff and non-EA stakeholders in RB management.

The focus in SI is situation improvement through changes in understanding and practices; this involved nested activities depicted by the verbs (actions): (i) ‘make sense of situation’ (e.g. through use of group-based systems diagramming); (ii) ‘tease out accommodations’ (e.g. by using an understanding of the politics of the situation to design workshops) and (iii) ‘define possible actions’ (e.g. by orchestrating debate about the congruence, or lack of it, between systemic models and what was happening or not). The overall inquiry (system) was monitored, measures of performance articulated against acceptable criteria (the three e’s of efficacy, efficiency and effectiveness) and control action taken (see Collins *et al* 2005 for more details). Understood in this way a SI can be seen as a meta-level process for programme, and constituent project, managing.

The SI has meant that the research team have sought to work in a more innovative way with Agency staff in shaping the work as well as in ways of working. Perhaps one of the most important framing devices in the project was the emphasis placed on developing a co-researching role in the management and undertaking of the project. The willingness of the Agency to accept this framing enabled the project to explore emergent issues as they arose and develop an agreed response as appropriate. This allowed all those involved (including the researchers) to learn our collective way towards progressing the RBP project.

Our approach meant the role of the researchers differed from traditional forms of research or consultancy in two important ways. First, we agreed to compile an ethical statement to inform our practices and dealings with each other. The process of developing the ethical statement in itself became a means of building mutual trust and understanding. Second, the project was couched in terms of co-research such that both parties agreed to work together to develop the project’s focus, work and learning. In practice, the researchers and core EA project staff worked alongside each other to surface our collective understanding about river basin planning. Examples of activities which emerged from this approach include: agreeing to convene a workshop on a new

emergent theme; facilitating a new stream of workshops associated with stakeholder engagement; holding a one-off meeting with senior Agency staff to assess the implications for the future of the RBP; and providing greater flexibility on budgets and work planning within the project.

This more emergent way of working is in stark contrast with the EA's previous project management system which atomised areas of work from the outset of the project and proscribed ways of working which, in the experience of the EA staff, ensured that they either never gained, or quickly lost sense of 'the big picture'. Discrete parcels of work became systemically detached and were undertaken in conceptual isolation from each other, leading to general confusion among the project team about the underlying rationale and purpose. This was exacerbated by frequent staff turnover or re-assignment.

This confusion was often conflated with uncertainty about what needed to be done in order to do RBP. From our perspective, the WFD presents a major challenge to the EA's existing practices: a shift away from 'how to do RBP' to a focus where there is explicit recognition of the need for 'learning how to do RBP'. Reaching and articulating this shift through the SI proved to be a major insight, for the EA staff involved, into the nature of the work facing them and opened up new possibilities of re-conceptualising ideas about RBP. Staff in the project began to move out of the trap of thinking that the EA should already know how to implement the WFD through RBP and therefore could be project managed using existing procedures. In evaluative interviews senior managers expressed relief on realising that RBP was complex, difficult and challenging and therefore needed a systemic, social learning approach rather than a systematic project management approach.

Unreflective or unknowing reliance on inappropriate project management tools to deal with messes (complex and uncertain phenomena) is, we would suggest, a precarious position for any public policy organisation. Experiences of using systems practices in the workshops we facilitated with the EA were generally positive and often accompanied

by more creativity, insight, clarity and enjoyment. This suggests the skills for systems thinking and practice of key Agency staff could be developed and enhanced so that the advantages and disadvantages of using project management tools are better understood from a systemic perspective.

While the above constitute, in our and our co-researchers' experience, positive outcomes of designing and using systems approaches to EDM, there are some key drawbacks. Perhaps the most important is the time required to negotiate levels of trust sufficient to allow experimentation within existing organisational cultures. In our work, we were keen to avoid being 'consultants' preferring instead to occupy a position of co-researching with EA staff. This methodological commitment was not easy to align to pre-ordained timetables within the wider WFD programme and presented challenges for everyone involved, not least the unending pressure to 'dive into detail' about the 'how' when the higher order question of 'what' was still in abeyance. Because of the small 'p' political nature of most engagements and the rapidly changing context each engagement became a novel design setting in process terms; this is challenging as it leaves less time for reflection on action, placing more emphasis on reflection-in-action (Agyris and Shön 1974).

A drawback of using systems approaches to EDM is that it can raise expectations that this approach will 'provide' a solution to the problem. In the EA, this expectation, however reasonable or misplaced, can place increased pressure on managers to support and enable the expectations to be realised to some degree or to demonstrate adequately why these cannot be met. Equally, it will be important to acknowledge that there will always be reluctance to engage with social learning approaches for many reasons. The key to managing both sets of expectations is to demonstrate how social learning approaches built on systems thinking and practice can enable staff to do their existing jobs more effectively, even if there are up-front costs in skills investment. In keeping with a learning approach, this would be achieved by enabling staff to experience the techniques and approaches for themselves in a way which does not

impose. This is more likely to enable staff to determine the relative merits and disadvantages of the approaches for their own work.

4. Discussion and conclusions

What is it that we can claim about our designing and its cybernetic features in the two cases? Both cases have in common a central model of a learning system which is employed heuristically to orchestrate praxis. In both cases a range of diagramming (or modelling) approaches for engaging with situations of complexity and uncertainty by starting out systemically have been employed. Our experience is that starting out in this manner transforms situations in which student or research participants find themselves by facilitating or mediating changes in practices and understandings (SLIM 2004a). Systemic diagramming can surface different mental models about situations and reveal patterns of influence and causality, boundary judgments and positive and negative feedback dynamics. This happened in our workshops with EA participants; evaluative interviews revealed that the approach enabled many to acknowledge the complexity of their situation (for the first time) and to recognise that they had to learn there way to appropriate actions. When situated in contexts which acknowledge participants prior experience and the historicity of the practitioner (decision maker/stakeholder), as well as tools/techniques and situations, we have found it possible to create the circumstances for the emergence of social learning, understood as concerted action, in situations of complexity.

In the EA case the model at the core of our praxis has not been presented to participants overtly as in the course examples. In this sense our practice in the EA settings is more attuned to the idea of systems practice being a silent practice, identified in various meetings and workshops of the SPMC (Systems Practice for Managing Complexity) Network (see http://spmc.open.ac.uk). This situation seems to be a trap into which those claiming to be using systems approaches have fallen, as the end result is that there is no institutional capital built around systems thinking and thus no demand-pull for new graduates. It also limits the possibility for second-order learning. But as we ourselves know, it takes time to build trust and relational capital (SLIM 2004c) in

situations where many of those present are there more by work-based demand or coercion, than choice. We see this as evidence that the emotional settings for our praxis are critical as are issues of power.

Both cases reflect design settings where on-going practice is influenced by feedback, though the nature and attenuation of this feedback varies significantly between the two cases. At the moment the OU-course based model has attenuated feedback (in that course surveys are not annual and because the course tutors, called associate lecturers, the people who have most contact with students and have primary responsibility for 'teaching' the course are not full-members of the 'course design and presentation team'. More importantly though, when feedback does arrive (via on-line support conferences; meetings with tutors or surveys) there is usually only minimal capacity within the 'design team' to respond, unless drastic, because of broader organisational structures, including costs. For this reason student numbers is the primary measure of performance – but it is a blunt instrument in terms of design (unless of course design is simply to produce high population courses).

Historically the main time for response has been the next course, as typified by the shift from T860 to T863 but this too is largely dependent on the conservation and re-building of a community of practice. We made the most of this opportunity; our process was one that tried to take account of our experience and our conceptual blinkers by inviting others into the process at the beginning to gain fresh perspectives and to challenge our starting assumptions. We could have just systematically made changes to the T860 framework (Figure 2) but instead we stood back, took stock of feedback and new starting conditions and imagined our way into the future (a form of backcasting) in terms of professional needs (e.g. re legislation, professional recognition requirements, group working etc.). We ended up with a conceptual framework that has some similarities (same focuses e.g., modelling, evaluation) but also quite a lot of differences (different configuration, simplification of what could be perceived as linear stages etc.). We also took on increased emphasis on issues of power and negotiation needed in mature participatory decision making processes etc.

In the past, course-based summer schools were a device that, in cybernetic terms, provided some error correction adapted to individual student circumstances. Summer schools are now rare and it remains unclear how ICT-mediated interactions will fulfil this role, though there are many models now in operation in the OU where it is being tried. An OU-wide requirement for the new course was that we employ the web-based eTMA submission, marking and monitoring system which has replaced the paper-based system; we also had to be aware of the new VLE (Virtual Learning Environment) being developed that will be available to all students over 2007-8. In his analysis of the history of design of OU learning systems Ison (2002) imagined a trajectory towards an OU-based platform for the emergence of self-organising learning systems, made possible by a second-order pedagogy i.e., where learners were asked to design a learning system for others as a result of their OU study. It remains to be seen if this will come to pass; some of the design considerations we allude to here, as well as those of the open source movement, could assist such a design. The danger is that new technologies merely continue to mediate only first-order learning systems.

On the other hand the EA systemic inquiry has required constant iteration and being open to the changing context to effect on-going process designs. However, the model for systemic inquiry, just like the EDM frameworks, has proven to be robust, and as a conceptual framing has supported our practice well. Despite our efforts it has taken time, and particular circumstances, to leave behind in the EA context responsible, systemic environmental decision makers, capable of extending this form of praxis. And despite five years of funded project activity there is still limited capacity; capacity building is, in our view, a pressing need.

How we understand the learning systems we design also affects who we are and, in a way, shapes our identity – what it means to be a teacher or academic. The changes described above for the OU could thus be conceptualised as an ‘identity transforming system’. Unfortunately we do not yet have any good systematic evidence as to whether our courses are ‘identity, or life transforming. We certainly have anecdotal and

experiential evidence, particularly from moderating student's EDM projects (Table 1), that this is the case among students who perform best on the course. We also have evidence that this is the case for some EA staff working with us (Collins et al 2005). Snodgrass and Coyne (2006), based on their hermeneutic thesis of design, claim that design is also 'an unfolding of self-understanding, since it reveals one's pre-understandings. It uncovers the preconceptions that are constitutive of the design outcome and at the same time brings to light the prejudices that make up what we are' (p. 257).

Both cases are also exemplars of doing action research in that they meet the four criteria for doing AR outlined by Checkland and Holwell (1998): (i) the process must be recoverable by interested outsiders; (ii) it must involve the researcher's interests embodied in themes which are not necessarily derived from a specific context; (iii) involve iteration, which is a key feature of rigour, and (iv) involve the articulation of an epistemology in terms of which what will count as knowledge from the research will be expressed. One of the advantages of learning system design praxis is that it breaks out of the dualism that some would claim to be at the core of designing, that it is solely an hermeneutic event in which 'application is interwoven with and inseparable from interpretation and understanding' and not an epistemological event (Snodgrass and Coyne 2006 p.50). From our perspective within an epistemology of second-order cybernetics these constitute a duality in which all knowing is doing (Poerksen and Maturana 2004).

Forester (1999) emphasised the need for practices which attempt to remake our common future. On the basis of our experience we suggest that a praxis shift towards the design of learning systems in domains such as education and public sector managing in particular offers the possibility of strengthening a deliberative and reflexive society better able to engage with the many situations of complexity, uncertainty and conflict that we now face. A praxis in which first and second-order designing, as well as systemic and systematic practice is realised would seem to meet the ethical dictum of von Foerster (1992) of: act so as to maximise choices.

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Figures

Figure 1. A model of different influences that have shaped contemporary systems and cybernetic approaches

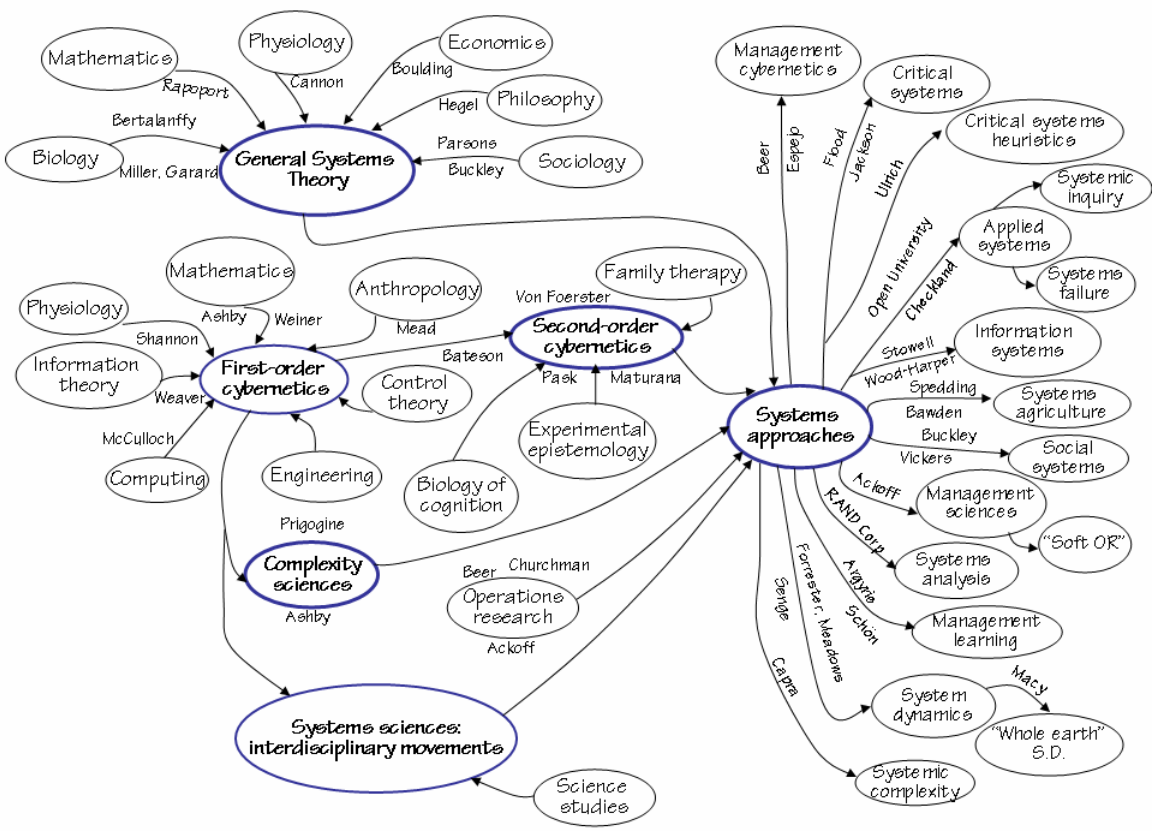

Figure 2. The first OU environmental decision-making framework developed and presented in 1997.

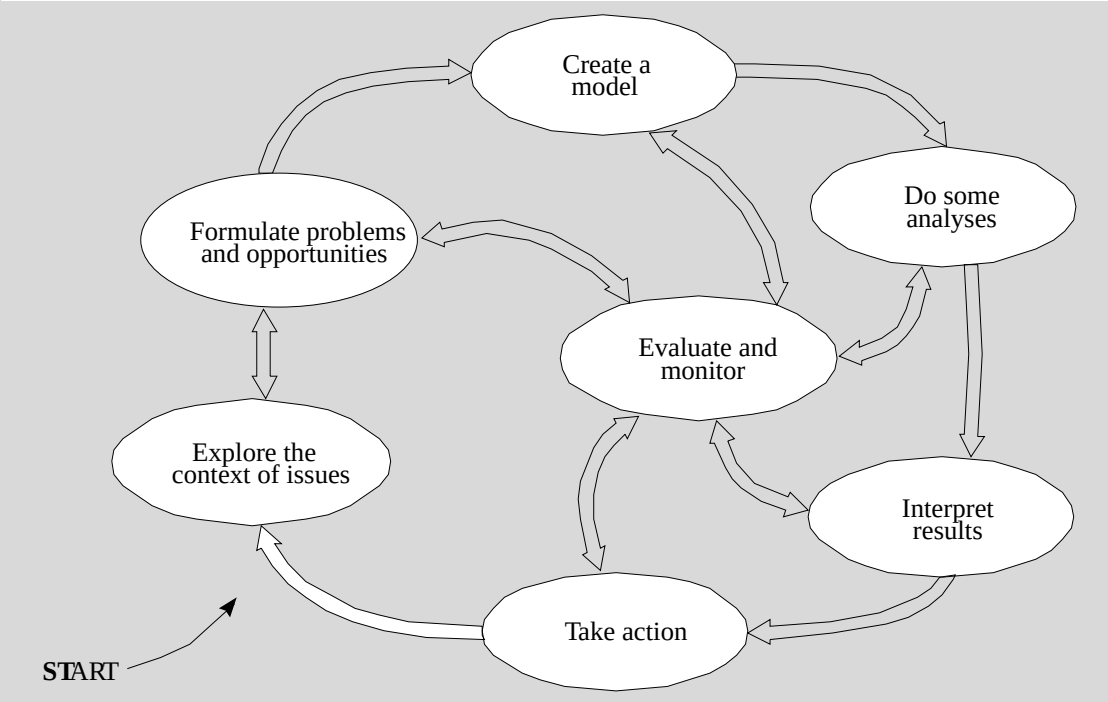

Figure 3. The revised OU environmental decision-making framework for the course T863 showing how the course is structured in four books.

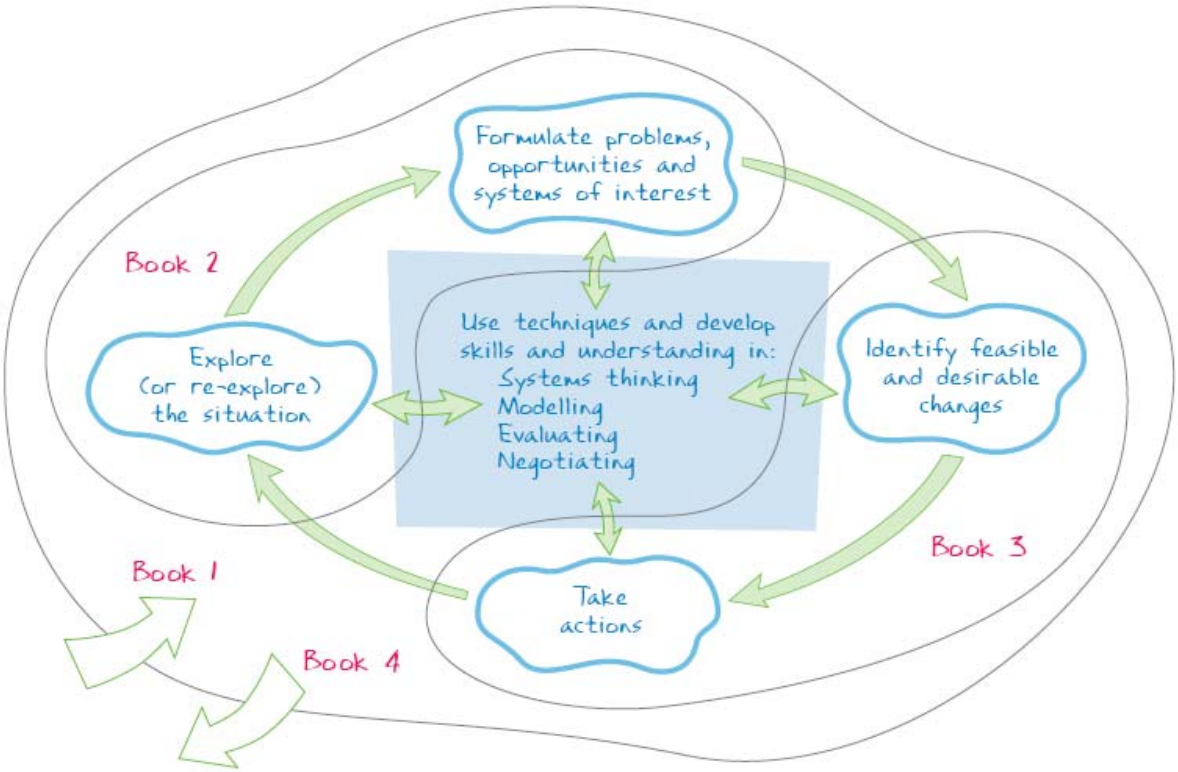

Table 1. A summary of the designer's expectations of T863 students for their end of course assessment, a self-selected project from an EDM situation.

Investigation and analysis using the T863 framework

This is worth 60% of the total marks.

Use the T863 environmental decision-making framework (Figure 3) to investigate and analyse the situation you have selected for your project, i.e. your system of interest.

This will involve:

- a detailed investigation of the situation considering multiple perspectives, including your own
- analysis of the situation using the four main framework stages and other relevant concepts you have learnt in this course
- selecting, using and evaluating appropriate techniques (which must include diagrams) associated with systems thinking, modelling, evaluating and negotiating.

Critical appraisal of the T863 framework

This is worth 20% of the total marks.

This will involve:

- critical appraisal of the framework as a whole
- critical appraisal of your own use of the framework

A further 10 % of the marks will be awarded for the title, summary and conclusions and 10 % for structure, coherence and presentation.