

## **Found Difficult and Left Untried: why senior managers seem reluctant to engage with Systems Thinking**

### **Abstract**

In this paper the author reflects on her observation that senior managers appear reluctant to engage in Systems Thinking. Interlinked features of the managers' environments, organizational culture, some potentially off-putting features of Systems Thinking itself and the author's own practice are explored for clues. The reluctance to engage with messes in the absence of systems skills and the unwillingness to engage with Systems Thinking are seen as constituting a mess in themselves, sweeping in many of the observations of Argyris about the difficulties smart people have with learning; and of Ackoff about the challenge of Systems Thinking to organizations.

### **Keywords**

Systems Thinking; Difficulties and Messes; Wicked Problems; learning

### **INTRODUCTION**

G. K. Chesterton (1910) observed of the 'Christian ideal' that it 'has not been tried and found wanting; it has been found difficult and left untried'. Much the same could be said of Systems Thinking. This paper is an attempt to unwrap some reasons why systems thinking is not more widely espoused and used. G. K. Chesterton's book was called 'What's Wrong With the World'.

The lack of take-up of systems thinking has been an issue for discussion amongst systems thinkers for many years and is often observed to be 'a silent practice' (Ison, 2003). This paper arises from my reflections on observations that have been troubling me, and continue to trouble me, during a period of internal secondment in which I have been working to develop the systems-thinking capabilities of Open University staff. These observations have occurred over four and a half years and I detect emergent patterns that I would like to understand better – not least because they have a much wider relevance than my own work.

- Pattern 1: the idea of developing systems-thinking skills is one that elicits apparent enthusiasm from senior staff and workshops and skills-development programmes are negotiated and agreed for whole departments. With only a few exceptions, the senior staff member then does not appear on the day.
- Pattern 2: a senior manager professes interest in learning systems-thinking skills and requests support but setting dates for coaching or mentoring proves impossible.
- Pattern 3: a manager opts to attend a workshop called *Experiencing Systems Thinking* but does not engage with the activities and later lets it be known that they would have preferred a theory-only session.
- Pattern 4: a senior manager accepts an invitation from colleagues to a facilitated workshop concerned with moving a particular university project forward. The workshop will use systems approaches because a number of staff have used systems before and are enthusiastic to use it together. The senior staff member opts out of the workshop activities, engages in passive-aggressive behavior that embarrasses and angers his colleagues and thereby significantly reduces the value of the workshop.
- Pattern 5: a senior manager is known to be enthusiastic about systems thinking but shows no evidence of using it and undermines any attempts by others to engage with it.

It is tempting to attribute these behaviors to some inherent pathology of senior managers and, in my darker moments, I have been known to indulge in this sort of 'blame story'. However, systems thinking reminds

me that blame is a form of dead-end thinking that allows very few options for change. So, how are these behaviors be understood in ways that allow action-for-improvement?

It is also important to observe that I have made these and related observations in other organizations as well as at the Open University.

These observations are a subset of a wider set of observations. It is hard to attract students to do Systems courses, although those that do are enthusiastic and excited by what they learn. It is also hard to sustain Systems as a discipline within a university. The Open University Systems Department has recently been merged with Communications in a forced marriage and it is increasingly difficult to defend the legitimacy of a strand of intellectual activity that, to many faculty colleagues, 'doesn't seem to be about anything'. It continues to maintain research interests in water-catchment management, Information Systems, environmental decision-making, ethics, personal effectiveness, and cooperatives. Systems Thinking's claim to wide-ranging applicability makes it hard to place, not only within faculty structures but within the subject maps used to sell courses to students and to assess research. All too often Systems ends up in some 'miscellaneous' category rather than being presented as a meta-discipline of (almost) universal relevance. Meanwhile, the popular media and Government departments have 'discovered' the notion of interconnectedness so that 'systemic' is often taken to mean that 'nothing can be done' or 'no-one is to blame'.

It is tempting to retreat with systems-thinking colleagues into conspiracy-theorist mantras: 'if only they knew what we know' or 'nobody understands us' - except that Systems Thinking *is* experienced as valuable, could be widely available and there is abundant evidence of the need for it.

## A FRAMEWORK OF IDEAS

In the course of my reflections, I have turned some systems ideas on Systems itself to try and make sense of the situation. In particular, I have used Russ Ackoff's notion of a *mess* (Ackoff, 1974, 1981), the related ideas of *wicked problems* (Rittel and Webber, 1973), and Peter Checkland's Soft Systems Methodology (Checkland, 1991, 1999) to explore ways in which Systems Thinking might be liberated from its current small cadre of practitioners. I am seeking ways to support managers in dealing with issues they experience as showing soft complexity as well as ambiguity, circularity and unknowability - messy situations or wicked problems in other words.

In my work with managers, I distinguish between Systems Thinking and the tools and techniques that are both characteristic of it and potential access points to it. Thus Systems Thinking is, following Salner (1986),

- the ability to see parts and whole in relationship to each other and to work dialectically with those relationships,
- balancing the processes of analysis and synthesis;
- the ability to abstract from complexity so that organizing structures are revealed rather than imposed (or assumed);
- the ability to balance flexibility and real-world change against the conceptual need for stable system boundaries and parameters;
- command of multiple methods for problem solving as opposed to employing a limited range of uncontextualized algorithms;
- awareness that the map is not the territory;
- and the ability to be provisional in the use of models.

Systems Thinking is living process. In my work developing the systems skills of managers at the Open University (and elsewhere), I usually use a 'basic set' of systems-thinking key concepts rather than methodologies in the belief that Systems Thinking is about *thinking*, and thinking differently, and that enabling people to access this type of thinking is more likely to create university-wide impact than requiring staff to learn methodologies. Thus I see systems-thinking tools and techniques primarily as break-through points to Systems Thinking, rather than as ends in themselves (though often powerful). In

this I, and my associates, have been profoundly influenced by Salner's work (1986) which notes the importance of the experience of 'epistemological dilemma' and the emotional challenge inherent in breaking through to a style of thinking that we would recognize as Systems Thinking, stimulated by the learner's own need to solve a problem. We also recognize the insights of Humberto Maturana (Maturana and Varela, 1992) in giving attention to the underlying emotioning that enables or disables new ways of knowing.

The basic set consists of:

- the distinction between difficulties and messes and the need to address them differently;
- perspectives (recognizing and being able to account for the partial and provisional nature of one's own perspective and the need to engage with others' to build a more holistic picture based on multiple partial views);
- rich pictures (both to capture the problem situation and as structuring devices for rich conversations);
- the idea of 'system' as an heuristic device;
- metaphor;
- diagramming;
- multiple causation, multiple influence and unintended consequences;
- interconnectedness;
- system hierarchy as a way of contextualizing action plans and proposals (each 'What' needs one 'Why' and some 'Hows');
- relevant systems including CATWOE criteria (Checkland, 1999); and
- criteria for the Efficacy, Efficiency and Effectiveness (Checkland, 1999)

This set of ideas is intellectually easy to understand but challenging to use and powerfully effective in opening up new options for action. It represents powerful ways of thinking systemically while being accessible and providing a starting point for learning additional systems-thinking skills or methodologies.

All of these ideas are framed within an explicitly epistemological framework – the idea, explored in the workshops, that 'thinking about our thinking' enables us to access alternative ways of understanding the issues that confront us and that this can lead to better ways of addressing the issues. In other words, Systems Thinking represents a choice about how we understand issues and with that choice responsibility for what we choose.

Experience with nearly 500 university staff (many of whom of whom have been self-selecting, based on curiosity or third-party recommendation) attending workshops and bringing their own messy issue to work on, has indicated that almost all attribute very high value to the workshops and approximately half continue to use some of the ideas afterwards. A smaller number come back (typically after a period of approximately six months) with specific requests for support in working on another issue. These observations were validated by a major independent review of the project (van Ameijde, 2007). This experience suggests that Systems Thinking is perceived as valuable by participants and represents a very high rate of continuing benefit compared to similar staff-development initiatives. It has nonetheless been the author's experience that workshop participants typically come from a management level below that where Systems Thinking might be expected to realize maximum benefit for the university.

## **HYPOTHESES**

Conversations with senior managers have elicited little evidence about the pattern of non-engagement with Systems Thinking. Explanations are typically located with proximate causes such as 'pressure of work' or 'something came up'. These reasons are certainly valid but fail to account for the attribution of priority. A few managers claim that they are already systems thinkers but even fewer are able to give an account of the basis of this claim. This inability to give an account does not invalidate this claim, however. If any form

of thinking is truly embedded in day-to-day practice it is understandable that the informal system thinker cannot give a 'thinking audit' of how they arrived at any particular view.

Without any substantial evidence about the pattern of non-engagement by senior managers, some working hypotheses must be explored. The simplest hypothesis is that senior managers, by the nature of their circumstances, genuinely do not have the time, energy or enthusiasm for learning Systems. If, as a systems community, we have not yet persuaded managers to invest time to make time, then this must be addressed by the community in its presentation of Systems Thinking's benefits.

**'It isn't that they can't see the solution. It is that they can't see the problem'**

An ideas spray around why managers often do not engage with Systems Thinking suggested a prior problem, that of recognizing messes. This is borne out by the author's experience where many of those who do not engage with Systems Thinking claim that they don't have any messes to deal with. This prompts my use of another G.K Chesterton quotation as the heading for this section (Chesterton, 1935). This may well be the case but, if we assume that there are many instances where managers could be more effective if they were able to recognize, and take responsibility for improving, messes then we can hypothesize about the inability to distinguish messes.

Firstly, senior managers have reached their position through a track record of success. They have a set of tools, ideas and experiences that have proved successful in the past. This has two likely effects: they have some self confidence that they can deal with issues and they may tend to view those problems they cannot resolve as irresolvable or as being someone's fault. Argyris notes that 'defensive routines' (Argyris, 1992, Argyris and Schön, 1978) are brought into play as managers seek to preserve their self esteem. Together these might make managers less able to distinguish messes (or wicked problems) in their own environments. Organizations support this stance in ways described by Donald Schön (1987), by work-arounds, avoidance, taboos and forgetfulness.

Recognizing the inherent unknowability and ambiguity inherent in messes is also difficult and counter-cultural. Not knowing may be seen as a difficulty preventing the 'solution' and managers may prefer to ignore the wider mess in favour of the problem of 'finding out'. A very senior executive, on hearing of the project to develop systems thinking skills in the university, observed 'It will never work. People cannot tolerate ambiguity.' Experience has, alas, lent credence to this view, at least as far as senior managers are concerned. It suggests managers prefer to deal with problems they don't have rather than those they often do face – or they choose to see the issues they face as difficulties, with all the limitations that choice creates. Not knowing also exposes the need to work with others and engage their understanding of the situation. This entails the three-fold challenge of recognizing the legitimacy of others' knowing; acknowledging the need of it (and thus risking revealing inadequacy) and thirdly taking the time and trouble to engage others in making knowledge and understandings available.

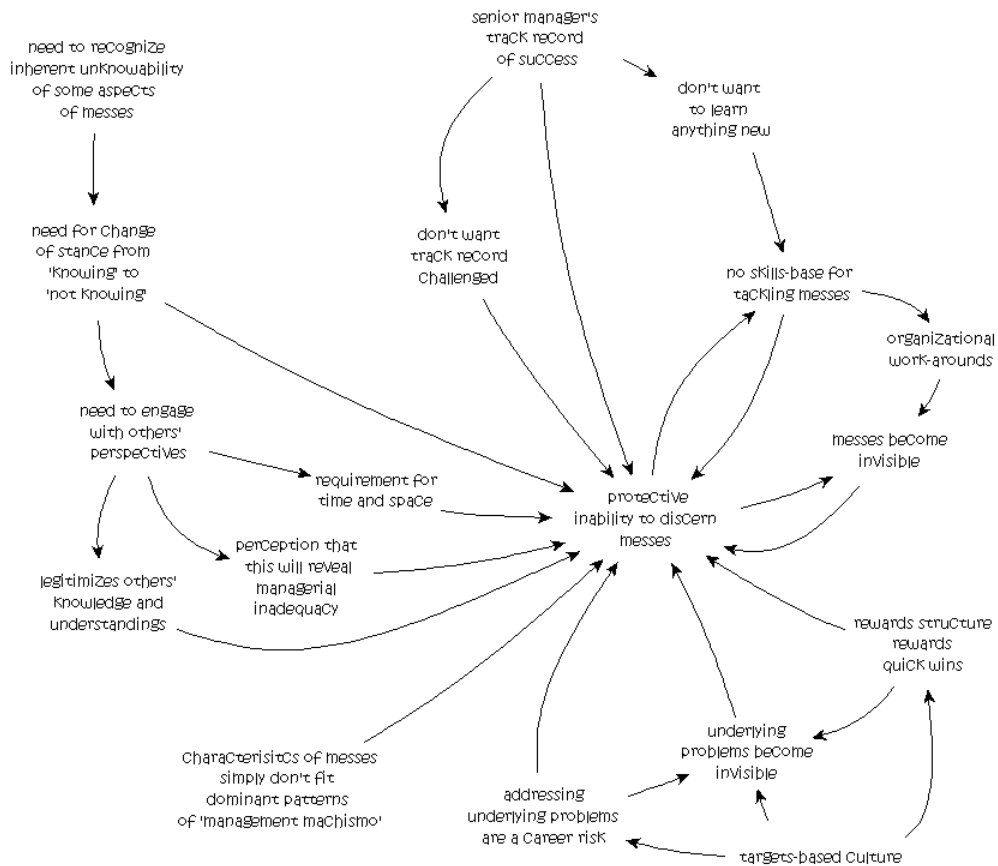
None of this is made easier by targets-driven culture that characterizes the public sector in many countries. When rewards are based on meeting targets and addressing underlying problems risks non-compliance, there is little incentive to engage with messes or even to notice them. Target-driven organizational cultures reinforce first-order learning (by rewarding 'quick wins') and make it harder to engage in second order learning that involves challenging the targets. Indeed, second-order, since it involves challenging the targets, and hence the 'performance of the organization' is a career risk, even for senior managers and executives.

Taken together, all these are powerful incentives to ignore messy situations and to avoid responsibility for taking them on. These hypotheses and their interactions are represented in Figure 1..

I find myself asking, *Why, without the skills for dealing with messes, would anyone choose to recognize and acknowledge messes?* A kind of mental hygiene springs a trap for both managers and those seeking to support by offering systems-thinking skills. Few would choose to take on the anxiety of acknowledging issues they do not have the skills to resolve but without that recognition, there is little incentive to engage with Systems Thinking.

Without a distinction between difficulties and messes, it is understandable that Systems Thinking seems to offer very little to time-pressured managers. Soft systems approaches add little to the resolution of a difficulty while systems approaches that require extensive modeling can be left to specialists. Indeed,

many managers who encountered Systems Thinking in MBA courses conclude it has little to offer because it is not presented, nor is experienced, in relation to the distinction between difficulties and messes (or between wicked problems and tame problems). Other misconceptions encountered by the author are that 'it's all about computers' and 'I don't have time to do it using Systems'. Although not much given to smart remarks, I have now twice responded that responding to the latter by asserting that they have don't have time not to do it with Systems. Both times this elicited a shock response that has resulted in a more open conversation about what the issue is and how it might be resolved.



Multiple-cause diagram of reasons for inability to discern messes

Figure 1

**Thinking means connecting things and stops if they cannot be connected**

G. K. Chesterton again. This time from *Orthodoxy* (Chesterton, 1909), as is the heading of the next section.

Other hypotheses concern the demands that Systems Thinking makes of managers. In the work of developing systems-thinking capabilities at the Open University, the Systems academics involved (Ray Ison and myself) have resisted attempts to 'roll out' a programme of development activities to departments and management cohorts. We have sought instead to rely on people's own interests and motivations in the belief that enthusiasm ('the god within') provides a much better basis for both learning and engaging with Systems Thinking. We have thus relied substantially on third-party recommendations to recruit participants to the programme. While recognizing that many participants will be unable to give an account of what Systems Thinking is, many have passed on the sense that 'it works' to colleagues who have then

signed up themselves. This strategy risks some misinformation about, and some over-enthusiastic accounts of, Systems Thinking but our experience is that this mode of recruitment works well and brings motivated and thoughtful people to the workshops. Except for senior staff. This raises questions about whether off-putting misunderstandings about Systems Thinking contribute to the lack of engagement. In conversation, a number of misunderstandings are evident but few are attributable to participant accounts. These misunderstandings are often 'it's about computers' or 'it takes too long'. The first is usually a long-standing misunderstanding and conversation around it is usually elicits some interest, though often fleeting. The second is more interesting and prompts further questions about whether we, as systems thinkers, convey a sense that Systems Thinking is primarily methodologies, or procedures. Other prevalent misunderstandings seem, alas, to be picked up from MBA studies where Systems is often treated as if it were simply about drawing systems maps and fishtail diagrams (the latter not in any case very systemic) decontextualized from any engagement with purposeful action or, indeed, purpose in drawing them..

While misunderstandings are relatively easy to understand and perhaps to address, I ask myself whether there are features of Systems Thinking that are genuinely problematic in the context of the lives of senior managers. I can identify seven features of Systems Thinking that may make it unattractive.

The first of these features is that, like Christianity, the acceptance of the Good News requires a prior acceptance of some bad news. 'Systems Thinking can help you address your problem' is only an attractive proposition when the client is enabled to see that the problem he is experiencing as intractable is actually part of a much bigger system of interconnected problems, many of which lie outside his responsibility. This is usually as welcome as the doctrine that we are all hopeless sinners. Over the years I have learned to manage this issue with consultancy clients but the different task of building systems-thinking capability is one where holding a mirror up to the messiness underlying many of the problems that present in a large organization is one I don't think can be avoided.

A second feature that may make Systems Thinking uncongenial to managers is a mismatch between the simplicity of the theoretical ideas and the challenge and difficulty of using them. Very few of the key concepts listed above are difficult to understand at an intellectual level. The demands, intellectual, perceptual, epistemological and emotional are, in my experience and that of workshop participants, challenging and difficult in the doing. For senior managers, accustomed to their own competence, this can lead to what Schein terms *Anxiety I* (Schein, 1993). The insights they enable are equally challenging and workshop participants struggle to integrate them with previous understandings, not least because they often involve discarding previous closely-held assumptions. Acquiring the skills takes practice and this too is difficult and challenging in an environment that feels unforgiving and risk averse.

The third feature is closely related to the second. Systems Thinking does not tell you what to do. It simply provides strategies for finding out. It is fundamentally *about thinking*. It is about taking time to explore unfamiliar territory. It is a skill – one that takes time and effort to master.

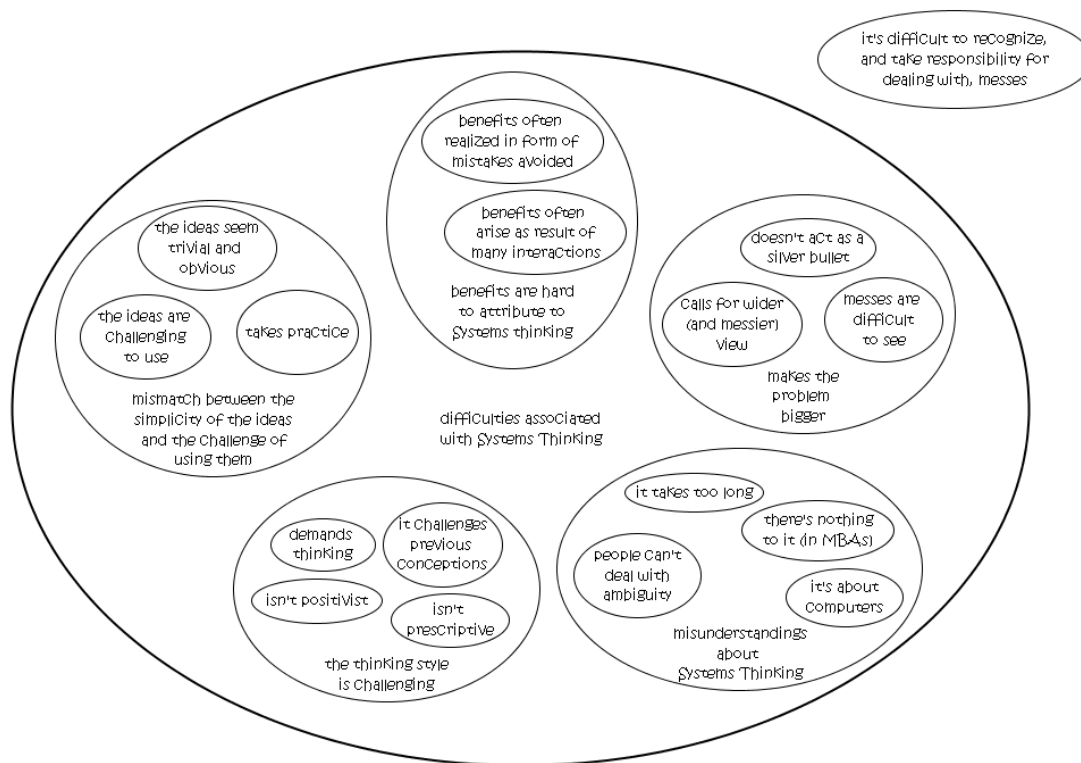
Since there is no 'closing rule' (Rittel and Webber, 1973) to tell you when you have 'solved it', the Systems Thinker has to make their own judgment about the adequacy of their thinking. I suspect that academics and academic managers are not immune from the need for a 'right answer at the back of the book'. Systems does not offer right answers although I firmly believe we can argue that it provides access to better ones. Thus my fourth unattractive feature of Systems Thinking is that by not providing right answers, Systems Thinking exposes managers to accountability for their own thinking and their own judgment. It is as if, in Fromm's terms (Fromm, 1942), Systems Thinking triggers a *Fear of Freedom*.

The fifth unattractive feature of Systems Thinking is the difficulty of attributing success to it. In a previous paper (Armson, 2007), I observed that 'success' emerges at a systemic level above that at which the Systems Thinking happens. It is an emergent property of the circumstances as well as of the thinking. That thinking, especially if it has become embedded, is unlike an algorithmic approach. It does not carry the label of Systems Thinking. People think what they think in the moment and only retrospectively will they account for their thinking in systems terms. The more Systems thinkers are skilled enough to take their Systems Thinking for granted, the less likely they are to be able to do this. Success is also difficult to attribute when the benefits of Systems Thinking are often realized in terms of mistakes avoided. Ackoff (2006) notes that errors of omission are usually the most damaging but also carry few penalties for the individuals committing them. One can extend this argument to say that Systems Thinking that results in avoiding such errors is, in a parallel sense, also invisible.

The sixth feature of Systems Thinking that makes it unattractive to managers is its attention to perspectives, reminding us that our viewpoint, however well informed, is partial, provisional, and likely to reflect a measure of our own interests, our traditions of understanding and our histories (Russell and Ison, 2000). Perry identifies three levels of epistemic development (Perry, 1970). I observe many managers exhibiting first-level dualistic ('right-or-wrong') thinking in ways that many might find quite shocking in their academic disciplines. One might speculate that this is because they carry authoritarian images about managers. Salner's work (1999) suggests that students at this stage of epistemic development are more likely to look for and to authority figures in decision-making situations. Managers also exhibit behaviors characteristic of Perry's second level of epistemic development, which he calls *multiplism*. In this stage, others' perspectives are recognized but not accommodated – agreeing to disagree with perspectives that cannot be reconciled with their own. Often, I notice senior managers expressing views that suggest that while they note others' differing views, their's is a privileged view because their seniority gives them a broader perspective. Genuine engagement with others' perspectives (Perry's third stage of epistemic development) is challenging. It directly confronts one of the values - 'to remain in unilateral control' - whose outworking Argyris (1991) observes in senior managers' theory-in-use. Salner, (1999) notes the 'profound cognitive reorganization that is involved' in recognizing the validity of perspectives other than one's own. Further, 'the confusion that results from the breaking apart of cognitive structures in the process of forming a new one is quite anxiety provoking. Normal psychological defences against anxiety serve as an additional retarding factor'.

Finally, the language of Systems Thinking may be both unwelcoming and repellant. All communities of conversation generate their own jargon. Systems is no exception. This is likely to be a problem, where it is a problem, for anyone encountering it and engaging with it. There may however be particular language usage that is specifically difficult for senior managers. For example, I use the difficulties/messes distinction coined by Ackoff (1974) in my work with people exploring Systems Thinking for the first time. In recent months I have been wondering whether Rittel's and Webber's distinction between tame and wicked problems (Rittel and Webber, 1973) might be more useful. It is, after all, janitors who clear up messes, while wicked problems have a bit more caché for the hero-manager. Perhaps more seriously, Systems is sometimes seen, if not as part of, then closely related to, the Mind, Body, Spirit movement. The trap is the word *holism*. I was taken by surprise when this came up as a question. I, and I assume most Systems Thinkers, attach specific, technical and rigorous meanings to the word *holism* and its co-derivatives but they have acquired a guilt by association with holistic medicine, which includes practices whose rigor is hard to discern. This potential misunderstanding may inform a mis-perception that Systems Thinking that gives critical attention to one's own traps (Vickers, 1972) and perspectives is introverted, personal and 'a bit touchy-feely'. Senior managers who prize rationality and rigor may well experience 'holism' as stepping away from rational, defensible and clear management that supports their self-esteem.

All these features are captured in Figure 2.



A system of difficulties associated with Systems Thinking for managers who have not taken it up

Figure 2

**Poets do not go mad; but chess players do.**

Argyris (1991) tells some powerful stories about how, in defending their own world-views, senior consultants resort to evidence-free stories about ‘them’ and how ‘they’ are to blame for preventing achievement of the high standards the consultants set themselves. I am in imminent danger of falling into such a trap myself. This paper is an attempt to avoid that trap by making sense of the evidence and placing it in a context of previous related observations and evidence (Ackoff, 2006; Argyris, 1991, 1992; Salner, 1986, Schein, 1993).

It is clear that a small project cannot have a major impact on the disposition of senior staff nor on the prevailing culture of a large but loosely-coupled organization. It is also clear that in my practice I am confronting a mess/wicked problem, a system of interconnected phenomena that, taken together, make it difficult for senior managers to engage with Systems Thinking. It is further clear that the style of engagement that I have been offering to senior managers neither addresses these difficulties nor meets their needs. In addressing this mess, however, it is important not to seek ingenious solutions or even elegant theories about what should be done. So, for example, Argyris’s approach that encourages senior managers to examine the theoretical bases of their own behaviors (Argyris, 1991) seems no more likely to work as a solution than Systems Thinking itself. I am reminded that messes take a prolonged periods of improvement. There is no instant solution. And it seems likely that I cannot do much of this on my own. The cool logic of the strategising chess player must give way to the engagement of the poet who brings together experience, emotion, intellect and rigour in the creation of a new expression.

In recognizing this mess I note my reluctance to acknowledge the implications and identify with the reluctance of clients to engage with their own messes. This is humbling.



## CONCLUSION

The failure of Systems Thinking to engage senior staff is a mess. Confronting messes is never easy. It has been my consistent experience over many years of managing and consultancy that engaging with messes creates anxiety, a sense of inadequacy and episodes of minor depression. It has also been my experience that Systems Thinking almost always provides enough leverage to create confidence that something can be done. It is almost as if one has to sit awhile with the depression of confronting a mess to earn the capacity to take it on. This is where I am as I write. I am struggling to let go of the idea that if I search hard enough, or am ingenious enough, I can find a way to deal with senior managers' reluctance to engage with Systems Thinking. I am struggling against the (epistemologically) unhelpful idea that I have the solution to their problems if only 'they' would listen.

In a few weeks time, I hope I shall be able to bring all the resources I have learned from the community of Systems Thinkers to address this mess.

## REFERENCES:

- ACKOFF, R. L. (1974) *Redesigning the Future*, New York, Wiley.
- ACKOFF, R. L. (2006) Why few organizations adopt systems thinking. *Systems Research and Behavioral Science*, 23, 705-708.
- ARGYRIS, C. (1991) Teaching Smart People How to Learn. *Harvard Business Review*, 99-109.
- ARGYRIS, C. (1992) *On Organizational learning*, San Francisco, Jossey-Bass.
- ARGYRIS, C. & SCHÖN, D. (1978) *Organizational Learning*, Reading, NJ, Addison Wesley.
- ARMSON, R. (2007) How Do We Know It's Working? Addressing the Evaluation Conundrum. *13th ANZSYS Conference: Systemic Development: Local Solutions in a Global Environment*. Auckland, New Zealand.
- CHESTERTON, G. K. (1909) *Orthodoxy*, London, John Lane Company.
- CHESTERTON, G. K. (1935) The Point of a Pin. IN CHESTERTON, G. K. (Ed.) *The Scandal of Father Brown*. London, Cassell.
- FROMM, E. (1942) *The Fear of Freedom*, London, Routledge & Kegan Paul.
- PERRY, W. (1970) *Forms of intellectual and ethical development in the college years*, New York, Holt, Rinehart and Winston.
- RITTEL, H. & WEBBER, M. (1973) Dilemmas in a General Theory of Planning. *Policy Sciences*, 4, 155-169.
- RUSSELL, D. B. & ISON, R. L. (2000) The research-development relationship in rural communities: an opportunity for contextual science. IN ISON, R. L. & RUSSELL, D. B. (Eds.) *Agricultural Extension and Rural Development: Breaking Out of Traditions, a second-order systems perspective*. Cambridge, Cambridge University Press.
- SALNER, M. (1986) Adult cognitive and epistemological development in systems education. *Systems Research and Behavioral Science*, 3, 225-232.
- SALNER, M. (1999) Preparing for the Learning Organization. *Journal of Management Education*, 23, 489-508.
- SCHEIN, E. H. (1993) How Can Organizations Learn Faster? The Challenge of the Green Room. *Sloan Management Review*.
- SCHÖN, D. A. (1987) *Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning*, San Francisco, Jossey-Bass.
- VICKERS, G. (1972) *Freedom in a Rocking Boat*, London, , Harmondsworth, England, Penguin.

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