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Managing Complexity: A Systems Approach

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Introduction

When you meet with a situation you experience as complex you need to think about yourself in relation to the process of formulating a system of interest. Only with this awareness, can you increase your range of purposeful actions in the situation which are ethically defensible. To do so is the hallmark of systemic thinking and practice compared to systematic thinking and practice. The metaphor of the systems practitioner as a juggler of four balls is introduced as a device to explore skill development for effective systems practice – the balls are ‘being’, ‘engaging’, ‘contextualising’ and ‘managing’.

To start, you will be invited to think carefully about yourself in relation to the unit itself – as an introduction to thinking about yourself in relation to any system you devise. This unit introduces the metaphor of the systems practitioner as a juggler of four balls: ‘being’, ‘engaging’, ‘contextualising’ and ‘managing’. This provides a device to explore skill development for effective systems practice.

This OpenLearn course provides a sample of level 3 study in Computing & IT

Learning Outcomes

After studying this course, you should be able to:

- reflect on personal purposes and expectations of doing this course
- record personal initial and developing understandings of what the course is about
- keep an on-going record of these developing understandings, expectations and experiences
- use a Learning Journal to record any reflections
- take responsibility for these reflections.

1 Managing complex systems

1.1 Thinking about expectations

Anticipations and preconceptions are an important determinant of how people learn, so before you read on, I would like you to record some of what you are experiencing now as you begin the unit.

It's important to get these impressions noted down now, because new ideas and new impressions will quickly overlay the experience. What you are experiencing now will be re-interpreted as new understandings emerge. You are also likely to form some judgements about your expectations. So before any of that can happen, make some notes on your responses to the questions in the activity below. I suggest you make your notes in a form that allows them to be incorporated, either directly or indirectly. You will need to keep referring back to them as the unit progresses. It will also be helpful later if, as you make notes, you date them and leave space for later thoughts and jottings. Your notes should capture as many elements of your responses as possible.

The notes that you make for this, and some of the other activities, will be important later. You should do them as conscientiously as possible. Their role in developing your skills will become more evident as you continue your studies in the area. Your notes should capture as many elements of your responses as possible.

I anticipate you might spend around **90 minutes** on this activity. It may take longer. This may seem like an enormous amount of time, but thinking about the issues carefully is likely to take that long.

Activity 1

1 hour(s) 30 minutes(s)

What is your purpose in doing this unit?

What do you hope to get from the unit? I imagine you might have some expectation that you will enjoy, or benefit from, doing the unit. What benefits do you expect? What was it in what you heard about the unit that suggested you might benefit from it? What was it about the unit or its descriptions that appealed to you? What is it about you that the unit appealed to? Not everyone chooses to take this unit so there must have been something about you that connected with what you heard, or read, about the unit. Make a note of any specific items that appeal to you. Make a note too of any items that worry or concern you.

What is your emotional state as you approach the unit?

Are you excited, bored, eager, puzzled, expectant, tired? What is your present body posture? Does it tell you anything about how you feel? Is it right? Can you improve your physical comfort?

Are you comfortable with your workspace? Are there things you can do to improve it?

What sort of skills and capacities do you think you might need for the unit? How many of these do you have already? What skills will you need to pick up? What will you need to look for in the unit to acquire these skills and capacities?

How does your answer compare with your notes on what you hope to get from the course? Are they congruent or does the answer to this question throw new light on what you hope to get from the course?

When you make a judgement about how you rate your capacities, what are you basing it on? Are you taking account of external factors such as the time you have or the circumstances in which you study? Are you basing your judgement on your own evaluation of your intellectual capacities? Do energy, enthusiasm and commitment come into the evaluation?

The activity you have just engaged in is the first of several such activities. It is an example of a pattern of activities that constitute reflective practice or reflective learning. This style of learning is based on the notion that the understandings most useful to us, and that most readily become part of us, are learnt by experience. The activities are designed to enable you to discover your own learning by experience.

There will be a lot about reflective practice in this unit but for now I want to introduce you to some basic ideas about it.

1.1.1 Learning by experience

It's a familiar idea but it implies two activities: learning and experiencing. Both activities need to happen if I am to say that learning from experience has happened. Experiencing seems to have two components. The first is the quality of attention that allows me to notice the experience and its components. The second is memory. Calling experience to mind allows me to examine the experience and to think about it in ways that were not possible at the time. Learning is what I take away from that process that influences my behaviour or thinking in the future.

But huge amounts of experience escape without being consciously experienced; I am insufficiently aware at the time to notice what's going on. Later I am too busy to recall the experience and so little conscious learning takes place. Of course, it's useful to carry out familiar activities ‘on auto pilot’ – without conscious attention. It's easy to miss out on important learning from unfamiliar activities too. I may become wrapped up in the activity itself or simply not notice the range and quality of the experience. Either way, a conscious attempt to recall the experience and to think about it, gives the opportunity to learn from the experience.

So, what was my purpose in asking you to do the activity above? I wanted you to experience the starting of this unit as richly as possible. I was asking questions that I hoped would prompt you into awareness of what you were experiencing. It may be you discovered something new about yourself; your expectations of the unit; what you hope to gain from studying it; or about your capacity to succeed in it as a result. If not, don't worry. The point of the activity was raising awareness rather than discovery; and recording material that will be useful in future learning and reflection.

Spend a total of about **15 minutes** on the next two activities.

Activity 2

What do you understand the course title from which this unit is taken to mean?

The title of this course is **Managing complexity: a systems approach**. Before you go any further, make notes about what you understand by the term ‘managing complexity’.

What do you understand by a systems approach? Don't worry if you feel you only have vague ideas at this stage; record all your ideas as fully as you can by listing all the things you think it might mean. You may also wish to distinguish ideas you feel confident about from those you are not sure of.

Activity 3

Add any further thoughts about your expectations.

You may feel some of the expectations you had have already been changed. Add any postscripts about this to the notes you made earlier. Make it clear in your notes these are postscripts and what has happened to change your views.

This unit is taken from a level 3 Systems course. This carries certain implications about its level and its likely content. You are likely to have drawn some conclusions about what these implications are. Recognizing explicitly the presuppositions and assumptions you carry into a situation allows you to examine them. Presuppositions can get in the way of understandings. For example, if I assume a book is just about koalas, and don't notice it's about koalas in their eucalyptus habitats, I am quite likely to experience the text about eucalyptus forests as a distraction. This might lead me to misunderstand what the text is saying about eucalyptus habitats and, almost certainly, I would misunderstand its importance to the koalas. At the very least this will make me an inefficient reader and may make me an inefficient learner.

The next activity will help you to think through your expectations, assumptions and presuppositions about this course.

Allow yourself about **30 minutes** to do Activity 4, making notes as before.

Activity 4

0 hour(s) 30 minutes(s)

What activities do you expect to undertake in studying a level 3 course?

You may already have some experience of Open University courses. You may have other experiences of studying. What sort of activities do you expect to engage in when you study a course? What sorts of activities have in the past been most effective in enabling you to learn? These questions are easier to answer if you think back to a specific course or other learning experience. What did you actually do? What were the components of that course? What was their relationship to each other? If you have studied only level 2 courses before, what differences do you expect in a level 3 course? If you have studied at level 3 before, can you identify any differences between those courses and other, lower level courses?

Which components of your previous learning experience have you enjoyed most? Why?

Some people enjoy the initial meeting with new material most. Others enjoy testing their newly acquired understandings in exercises. Still others enjoy their new perspectives on things quite external to the course that their new understandings give them. Do any of these match your previous experience? If not, what was it for you?

You may also like to explore the question of what you *didn't* like. Have you changed in ways that might make your experience of this course different?

What were you, as the student, expected to do as you worked through previous courses?

Many courses follow a fairly steady pattern of a bit of theory, followed by an example of what the theory means in practice, followed by an exercise where the learner applies what they have just learned to another situation. Do you recognize this pattern? Have you experienced it? Have you experienced variations on this theme? What were they? Have you experienced alternative approaches? How successful have these patterns been for you? Success, in this sense, might mean examination success or it might be a success criterion you have set yourself, or one you want to apply now. It may parallel the criteria for success you identified for this course.

2 Preparing to tackle this unit

2.1 The nature of systems thinking and systems practice

There are no simple definitions for either systems thinking or systems practice. It's difficult to find definitions that capture all the perspectives that the ideas carry for people who think of themselves as systems thinkers and systems practitioners. Most systems practitioners seem to experience the same kind of difficulty in explaining what they do or what it means to be systemic in their thinking. Through experience I've developed some criteria by which I characterize systems thinking, but they seem to be quite loose in the sense that those characteristics are not always observable in what I recognize as systems thinking. In any case, they seem to be **my** list of characteristics, similar to, but not the same as, other people's lists. This issue will be developed but, for the moment, I would like you to hold the idea that systems thinking and systems practice arise from particular ways of seeing the world.

My hope is, through interacting with the unit and asking yourself questions about your experiences, you will discover at least some of these characteristic ways of seeing the world. If you have previously studied Systems courses, you will already have experienced forms of systems thinking and perhaps ‘caught’ it in some way. You may even have developed your own understanding of systems thinking and what it means. If you have not experienced a Systems course before, you need to be aware that this unit cannot make you into a systems thinker or a systems practitioner. It can only provide you with a framework through which you can develop your own characteristic ways of being a systems thinker and a systems practitioner. You will already have encountered, in previous Systems courses or through your preparatory reading, some of the central ideas of systems thinking.

Gather up your ideas of what these central ideas are by spending around **15 minutes** on the following activity.

Activity 5

0 hour(s) 15 minutes(s)

Make notes on what you think are the main features of systems thinking.

This is not a test question. There are no right or wrong answers. I am simply inviting you to explore what you already understand about systems thinking. Try to make your answer as comprehensive as you can. You could use diagrams if they're a more convenient way for you to represent your ideas.

If you have already studied Systems, you may find this task quite demanding because you will have to abstract these general ideas from what may be quite detailed understandings. Don't be afraid to spend slightly longer on this if you need to.

Try to ensure that, in doing this activity, you are building **your** understanding and not just abstracting a list from someone else's ideas.

As before, date your notes and leave room for later additions.

Your notes from this activity will form a powerful basis from which to build your understanding of, and capacity for, systems thinking. You will develop your own ways of working with the notes you take as you work through the course. My own way is to add new material in a different coloured ink, indicating the date of the new colour. I've also sometimes photocopied the notes and added new notes to the photocopy, which I photocopy again for yet more amendments and crossings out, dating each one as I go. This saves completely re-writing and I only need to rewrite when I have a different appreciation of something, or when it has developed so far the old version is no longer helpful as a foundation. Other people use computer files in a similar way. I prefer not to throw away any old version, even if it gets superseded. It provides me with a record of my developing understanding, especially if I note down what I now understand and why I now think the old understanding is unhelpful. Even notes I think are redundant can prove to be the anchors for new insights.

You don't have to do it my way but I would urge you to find a way that suits you. You will need to be able to record your own learning: perhaps even more importantly, you will find these notes invaluable as you take responsibility for your own learning.

My own answer to Activity 5 follows

You should not treat this as the right answer. You should certainly not make judgements about your own performance in the light of my response. My notes arise from my experiences, yours arise from your own. I would like to think you and I were both engaged in an activity that gives rise to new experiences and thus builds our own understandings from our own experiences. So I would much rather you treated the following as if we were in a conversation and use my ideas to develop your own.

The important features of systems thinking, as I see them, are these.

1. Systems thinking respects complexity, it doesn't pretend it's not there. This means, among other things, I accept that sometimes my understanding is incomplete. It means when I experience a situation or an issue as complex, I don't always know what's included in the issue and what's not. It means I have to accept my view is partial and provisional and other people will have a different view. It means I resist the temptation to try and simplify the issue by breaking it down. It also means I have to accept there is more than one way of understanding the complexity.

   Complexity can be quite scary. But it need not be: complexity becomes frightening when I assume I ought to be able to ‘solve’ it. Systems thinking allows me to let go of this notion and allows me to use a multiplicity of interpretations and models to form views and ideas about the complexity, how to comprehend it, and how to act purposefully within it.
2. Systems thinking attends to the **connections** between things, events and ideas. It gives them equal status with the things, events and ideas themselves. So, systems thinking is fundamentally about relationship and process. It is often the relationships between things, events and ideas that give them their meaning. Patterns become important. The nature of the relationships between a given set of elements may be manifold. They may be causal (A causes, leads to, or contributes to, B); influential (X influences Y and Z); temporal (P follows Q); or relate to embeddedness (M is part of N). These relationships spring to mind immediately but there are many others, of course.

This attention to relationships between things, events and ideas means I can observe patterns of connection that give rise to larger wholes. This gives rise to **emergence**. Thinking systemically about these connections includes being open to recognizing that the patterns of connection are more often web-like than linear chains of connection.

3. Systems thinking makes complexity manageable by taking a broader perspective. When I was studying engineering as an undergraduate, we were taught to break down problems into their component parts. This approach is so deeply entrenched in western culture it seems natural and obvious to anyone brought up or educated in this culture that this is the way to tackle complex problems.

   While this approach is powerful for some problems, it's hopeless for others. For example, it now seems clear that climate change induced by human activity is likely to have major impacts on the planet, its environments, and its living organisms, including people. But all of these effects are so interdependent it is impossible to discover what the effects are likely to be by breaking the problem down.

   Systems thinking characteristically moves one's focus in the opposite direction, working towards understanding the big picture – the context – as a way of making complexity understandable. Most people recognize they have been in situations where they 'can't see the wood for the trees'. Systems thinking is precisely about changing the focus of attention to the wood, so that you can see the trees in their context.

Understanding the woodland gives new and powerful insights about the trees. Such insights are completely inaccessible if one concentrates on the individual trees. Figure 1 illustrates this sort of shift of attention vividly.

Figure 1: This well-known puzzle picture only reveals its secret if you allow yourself to see the pattern of relationships between the black blobs. Studying individual blobs reveals nothing. If you really cannot see anything other than the blobs, don't worry. It doesn't imply anything about your capacity to be a systems thinker.

Systems thinking seems to come more naturally to some people than to others. Others have to learn to think systemically. People trying systems thinking for the first time find it quite tricky in the early stages. The temptation to break down the situation of interest into smaller bits is strong. The systems approaches you will encounter take account of this

and are designed to enable you to capture the complexity before you move on to exploring it.

During the 1980s and 1990s, there were significant advances in Systems theory. There were two main drivers for this. One was the tremendous advance in computing capability. This allowed the behaviour of fluid, chemical, biological, and other phenomena to be modelled through time. This generated wonderful new insights into what came to be identified as chaotic phenomena. The second was the renewed synergy between biology and Systems. Both these stories are exciting, and there are a number of well-written books for the general reader that describe some of this work (see the box below).

> *Would-be Worlds* (Casti, 1997, John Wiley & Sons Inc., New York) arose out of the computer exploration of systems behaviour. James Gleick's classic *Chaos* (1987, Penguin, London) is also in this tradition. Fritjof Capra's *The Web of Life* (1996, Harper Collins, London) explores some of the developments in biology that arise from a systems perspective.

Regarding the second driver, the synergy first emerged in the early 20th century among biologists concerned with the properties of whole organisms. This led to an exciting phase of synthesis of ideas from many disciplines that gave rise to General Systems Theory. Since that time, biologists who look at living systems as a *whole* have turned to systems theory for new insights and, in response to their findings, systems theorists drew new insights from biology.

For me, the practicality of Systems is even more exciting than these developments. This course is as much about systems practice as it is about systems thinking. There is an exciting synergy between systems theory and attempts to find better ways of engaging with problems and opportunities.

This is what the course is about. It is an invitation to engage with systems thinking in such a way that you are better able to address the problems, complexities and opportunities that **you** encounter as you engage with the nitty gritty of whatever you do. Systems thinking provides me with tools-for-thought and the opportunity for a powerful way of looking at the world, whatever the context. The contexts stretch all the way from international issues such as global warming to the day-to-day problems that arise in work, in domestic life and in the local community.

Systems practice in the context of this course refers to the practice of Systems within whatever profession or calling you follow. You can be a systemic medical practitioner, a systemic wood turner, a systemic technician or a systemic manager by applying systems thinking, insights and approaches to the complexity that you encounter in any of these or other domains.

2.2 Taking responsibility for your own learning

Not much of this unit conforms to the traditional pattern I mentioned earlier – the theory-example-exercise pattern. In particular, you will find you are expected to discover much of it for yourself. Why is this? This is a legitimate question and deserves a full answer. One year, a student at a residential summer school complained I had not taught him properly. I was, he told me, an expert and so why did I not demonstrate how to tackle the problem he was working on and pass my expertise on to him. He felt the tutorial was ‘a wasted

opportunity'. I could understand why he felt aggrieved. But I think he had missed an important feature of learning a skill such as systems thinking.

More and more, I've come to realize that whatever expertise I may have in systems thinking and practice, it is **my** expertise and it only works for me. In this I find myself in agreement with C. W. Churchman 'Churchman, C.W. (1971) *The Design of Inquiring Systems*, Basic Books, New York", who was one of the first people to write about what systems thinking might mean in practice, when he said 'there are no experts in a systems approach'. When I look at the people whom I believe to be experts in this area, I realize there are many ways of being good at systems thinking and many ways of being good at systems practice. Each systems thinker seems to be good in their own way. I believe this is because Systems is about ways of experiencing the world, ways of thinking, and about ways of dealing with the complex situations I encounter.

Consequently, systems expertise is unique to each person. I cannot tell you how it's going to work for you or how you should understand it. You have to find your own ways. All I can do is to invite you into experiences that are likely to help you create your own meanings from the material. As well as being the only logically consistent way of learning systems thinking, there is plenty of research evidence 'For example, see *Using Experience for Learning* (Boud, D. Cohen, R. and Walker, D. (eds) 1993, Open University Press, Buckingham)" to show that understandings and knowledge that one acquires through discovery is retained and developed much more readily than the understandings one acquires through being told, or even shown.

Taking responsibility for your own learning in this way is challenging but it need not be difficult. It requires a preparedness to experiment with ideas and styles of learning that may not initially feel right or comfortable.

All this means learning Systems, as the course team understands it, is an intensely personal business. Don't worry if you're not used to reflective learning, you will be able to develop your capacities for learning this way, as you go. This is why it was important to think through what you want to achieve from the course. It can operate at a level beyond acquisition of skills and knowledge. Because it is about different styles of thinking, the process of thinking systemically can itself give rise to new forms of learning. It has the capability of bringing understanding into being from sources inside oneself. This is the process known as reflective learning.

For some people, systems thinking will be something they practice from time to time. It will be a set of tools-for-thought they use when the need arises. This is a powerful and important potential outcome from the course. The course can also lead you towards becoming systemic, as well as being about systems. You can use it to become a different sort of thinker.

Either way, I strongly urge you to tackle the activities. They are designed to enable you to discover your own learning by experience. They are much more important than practice-makes-perfect activities. They will support you in making systems thinking and systems practice your own. Without them, systems thinking and systems practice remain 'out there' – something you may know about (description) but not know how to use (competence). This course has aspirations beyond that, which I hope you will come to share; to support you in becoming a systems thinker and a systems practitioner. This is why the activities so far appear to be focused on you. You might see them in terms of preparing the soil in which skills, competencies and confidence can grow.

2.3 Appreciating epistemological issues

Common sense tells me my experience and understanding of the world are limited. I am 173 cm in height. That limits my view of the world. It may not matter much that I cannot see what my house looks like from above but it does mean there will be things going on in the roof I may not notice until they impinge on areas that I can experience.

More significantly, there is a real limitation on understanding the experiences of other people. You might tell me about your experience but your description is likely to be only a partial representation and, however good your description, I cannot share your experience. I can only construct my own mental representation of what your experience might be like. But the limitations on my understanding of the world are even more fundamental than this.

My mental image of the world is a model. It is a partial representation of reality based on the partial knowledge I have of the external world. So, when I think I am thinking about the world I am thinking about my model of the world. This model of the world is built up in a way that is itself a model. So I am using a model, built by a model, to represent the world I think I see.

This has important implications. The model that represents the world tells me what I see and tells me what to see. The model both limits what I see and reinforces itself. When I think about the world, I am thinking about my own thinking; I have no direct access to the world at all.

Many people find this idea unsettling when they first meet it. It seems to defy common sense. It raises the question of how real the so-called real world really is.

Many people think of the brain as very similar to a computer. Both have a similarly large proportion of ‘processors’ operating on internally generated signals. But there is an important and absolutely fundamental difference. The computer does not create its own meanings. The computer has no capacity for deciding, for example, which are its favourite paintings in the National Gallery. I do. I have a history of interacting with external stimuli that generate new ways of interacting with further stimuli and the internal structure of my brain changes as a result. The computer's ways of dealing with data are not the result of its own self-production. The way the computer works remains the same, whether it is processing pictures from the National Gallery or whether it is processing letters of the alphabet. The rules that relate input to output are constant over time.

The question of what I can know about the outside world is an ancient one and has always been central in philosophy under the theme of **epistemology**. Epistemology is the branch of philosophy that deals with knowledge and knowing: how do I know about the outside world? how do I know my senses are not fooling me? what constitutes evidence about the world?

Neither discussions about modelling, nor the insights of philosophy, can tell me how true my internal representations of the world are, but neurological studies seem to suggest the outside world is unknowable as it is. Epistemology is a central concern in the course from which this unit has been extracted. This contrasts sharply with many other courses where epistemology is never addressed. The world is assumed to be ‘out there’ and more-or-less as it appears.

Recognizing the world is unknowable as it is presents me with a choice. How do I deal with the day-to-day observations and events that seem to emerge from it? Each person, once they become aware of this unknowability, is confronted with, and needs to make their own choice.

Each choice is individual but seems to cluster around three main poles. The first of these is to adopt a stance that the world is more-or-less as I see it, and to ignore the incompleteness of my viewpoints and my representations. This is equivalent to saying 'there is no epistemological problem about the world as I see it'. The second is to decide that the world is more-or-less as I see it but to recognize that my viewpoint is limited and the view-from-here may be misleading because it is only partial – there is no view of the roof, to use my previous metaphor. This is a stance that accepts that I must be careful to explore the world as fully as I can because I cannot see everything and may be misled. The third pole is to take on fully the implications of the world's unknowability. This stance demands that I always carry an awareness that I will never know the world and must therefore always be trying to account for my own role in my perceptions of the world. Consciously making the choice between these poles, and all the variants in between, is an act of *epistemological awareness*.

The choice one makes has profound implications for one's ranges of thought and action. Of course, knowing most of what I'm aware of is actually generated within my own brain does not mean I can make up any version of reality I choose. But it does mean I have to recognize my knowledge of, and understanding of, the world is partial and provisional and depends to a significant extent on my internal processes of constructing representations. This theme will come up repeatedly but for now it seems to suggest a number of attitudes or mental stances will be helpful.

Some of the mental attitudes I try to adopt are:

1. Being open and sensitive to all kinds of information about a situation: not just so-called factual information but impressions, intuitions and hunches, including other people's when they express them;
2. Being willing and able to see the situation from all kinds of points of view in addition to my own;
3. Being as open as I can be to seeing the situation and not letting my theories, presuppositions and assumptions tell me how I ought to see it;
4. Not taking terms of reference, boundaries or constraints too seriously; I try to assume they may not be as rigid as they seem to be;
5. Trying to find out how other people see the constraints and boundaries;
6. Being wary of any solution to a complex question (including my own solutions);
7. Enjoying diversity and complexity in a situation; resisting the temptation to discard inconvenient bits of information; paying more, rather than less, attention to awkward facts, impressions or ideas;
8. Not minding too much if there are areas of uncertainty in my understanding, or bits of information I don't have; being sceptical about the facts I do have.

Adopting a set of stances isn't necessarily easy so here are some suggestions about things you can actually do when you are looking at a complex situation that mystifies you in some way. (There are likely to be times when the course itself looks like a complex situation that mystifies you.) Practising these will help you to develop the open, enquiring style that can make systems work so exciting.

Make sure you include in your thinking about the situation:

1. The preceding history and the wider context of the situation;
2. Information about how people (including you) involved in the situation feel about it; what are the hunches, intuitions and suspicions they, and you, have about it;

3. Information about the dynamics (procedures, flows, communications, feelings) of the situation as well as the structure (roles, organization framework, boundaries, materials, components) and how the process and structure fit together;
4. Information about how the situation appears to other people, including those around the situation as well as those directly involved;
5. Attention to what is **not** going on and what is **not** present.

2.4 Review

In working through this section, you have identified some of your initial expectations and I have explained some of what I think you will discover as you work through the unit. It would be appropriate at this point to look at some of the questions I asked you about your expectations again and note ways your expectations have changed.

Spend a total of around **30 minutes** on the next three activities.

Activity 6

0 hour(s) 10 minutes(s)

Looking through your previous notes and my previous questions, identify and record any ways your expectations have changed.

Have any new expectations emerged from your reading of this new section? Do any of your expectations look less realistic now? Do your previous expectations seem more, or less, likely to be met?

Do you have any new ideas about what you would like to get from the course?

Activity 7

0 hour(s) 10 minutes(s)

Do you feel able to adopt any of the attitudes I have suggested?

Most people move into and out of the attitudes I described earlier. The difference I am proposing is that you consciously try and adopt them as you improve your capacities as a systems thinker. Do you think these attitudes will be useful to you? Have you adopted them in doing this activity? How successfully? You may like to record some judgement about whether you like the idea of these attitudes. Notice that I referred previously to ‘a willingness to experiment with styles of learning that may not initially feel right or comfortable’. Does this reflect anything you are experiencing at this stage?

Activity 8

0 hour(s) 10 minutes(s)

How do you understand the focus on your own responses in the activities and in the reading you have done so far?

Notice your intuitive responses as well as your intellectual responses. Are you puzzled? Stimulated? Surprised? Excited? Hoping it will get somewhere? Eager to find out more? Suspending judgement? Frustrated?

Any or all of these responses, even if they are a little difficult to live with, are likely to enable you to make good use of what comes in the rest of this block, and in the rest of the course.

It may also be you are unused to, or uncomfortable with, the focus on yourself and your own experience in an academic course. This need not inhibit your learning, provided you recognize your discomfort. If you stick with it, the unfamiliarity of this type of approach is likely to disappear. The payoff: you can become a person who can think and practice systemically. Without engagement with your self, Systems is likely to remain, for you, a collection of techniques that are never really your own.

It would be unreasonable for me to expect that you would instantly recognize this is an effective way of starting a course on Systems.

Make a note of your present understandings and responses.

3 Understanding systems approaches to managing complexity

3.1 Introduction

I wonder if you experience complexity in your daily life? For much of the time I struggle to keep my head above water as I try to understand and manage the complexity I experience as part of everyday life. I find social commentator and cartoonist Michael Leunig's depiction of a solitary figure looking through an 'understandascope' (Figure 2) a particularly skilled way of capturing the sense of bewilderment I sometimes feel. For the purposes of Sections 4–7 I am using his cartoon featuring the 'understandascope' because it raises a number of important questions relevant to my aims. Using Figure 2 as a metaphor, these questions are:

- What is it about individual human beings that characterize how they observe the world? i.e. what are the properties of the *observer* looking through the understandascope?
- How do humans engage with the world around them? i.e. what are the properties of the *understandascope*?
- What sense do humans make of the world they experience? i.e. what sense is the observer able to make about the 'messy' sea of human activity that is being engaged with through the understandascope?
- Does the observer stand outside the 'messy' situation being observed or do the properties of the 'understandascope' – the way in which s/he engages with the world – enable the observer to be an effective actor in it?
- What new understandings does the observer have after engaging with the situation through the understandascope?

Figure 2: Understanding complexity? (Leunig, 1985)

I use Leunig's cartoon as a means to introduce my **ideal** of a systems practitioner. As you work through this part of the course I want to invite you to imagine an ideal systems practitioner as a type of understandascope, as a lens through which to develop your own systems practice and to respond to the questions posed above. By ideal, I do not mean highly desirable. I am using the term in a philosophical sense meaning *a set of ideas about*, or *a model of*, a systems practitioner.

At the end of this course, my aim is that you will have a greater understanding of 'systems approaches to managing complexity'. But what makes it possible to say 'I understand someone or understand something about the world in which I live?' Is there a state of mind or body that can usefully be referred to as understanding? By the end of this course our hope is to have provided the means to respond to the question: What is it that we would need to have observed, in others or in ourselves, for us to say that understanding systems practice had occurred? In the language of the cartoon I am asking you to envisage

1. yourself as the observer;
2. the ideal systems practitioner as the understandascope; and
3. the complexity you are trying to understand as residing in the relationship between the observer (you) the understandascope (your appreciation of systems practice) and the context (the messy situation depicted in the cartoon).

You might find it helpful to return to this part as the course goes on. This will enable you to see how the issues raised here are taken up in subsequent blocks from different perspectives.

Figure 3 illustrates the general idea of a practitioner, P. I am using the idea of the practitioner as someone who engages with some so-called 'real-world' situation in practice, using selected approaches.

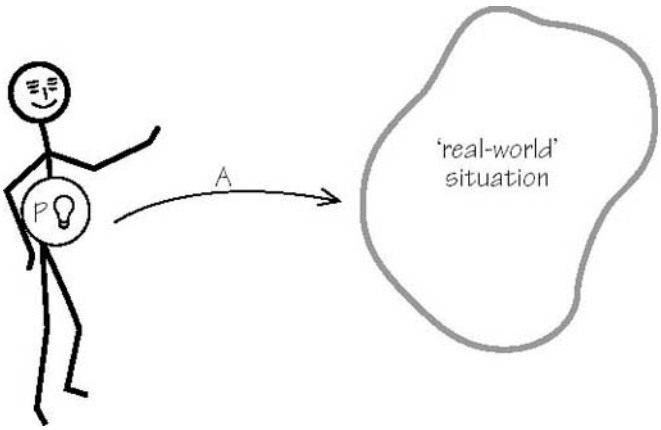


Figure 3: A general model for a practitioner, P, engaging with a 'real-world' situation using an approach, A

I am using the phrase 'real world' to distinguish from the conceptual world, the world of thinking. In many ways this is an artificial distinction because the world I perceive to be the 'real world' is, in fact, my own conceptual model. What I perceive is conditioned by my conceptual models. So for me the real 'real world', is unknowable. My desire is to change the question from 'what is the world' to 'how do I know the world'. So every time I use the term 'real world' you should remember that this is a short-hand for the process of coming to know the world.

Later, I will introduce the idea of the systems practitioner who is a special case of the general practitioner. Figure 2 also depicts a form of practice – a person using an understandascope to do something.

In this course, the idea of **practice**, or practising, is a general one in that it is something everyone does. The dictionary definition of practise is 'to carry out or perform habitually or constantly … to carry out an action'. Almost everyone has some role in which they practise. Most people occupy a number of roles, in their work or in their community. In these roles it is usual to encounter a number of issues that need dealing with, improving, resolving, or obviating. For example I am a practising father as well as a practising academic.

Activity 9

List some of the practices you engage in personally and professionally. Suggest some measures of performance for these practices, i.e. how do you know if you do them well?

Answer

For the purposes of this exercise I will refer to my practices as a father and as a researcher. I will use the following table to complete my answer.

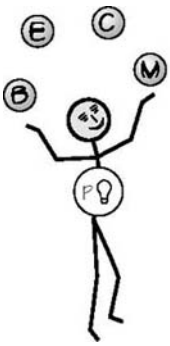
Practice	Measure of performance	How do I now if I do it well?
Fathering	Nature of communication with my daughter	We talk regularly and usually enjoy our conversations – my daughter gives me feedback and I listen (mostly!)

	Emotional quality of our relationship	I feel loved and understand this is reciprocated
	Extent of mutual respect	Manifest through mutual engagement in each other's work/ideas
	Extent of trust	By my daughter never feeling the need to have my permission to do something and by the lack of actions that betray my trust
Researching	Grants obtained	Am fully committed with a number of large grants in last three years
	Papers published	Two per annum is target which I usually meet.
	Invitations to talk/ participate	These continue to arrive.
	Extent of personal satisfaction	I enjoy myself when researching – but find admin distracts me
	Usefulness to others	More difficult – based on feedback and personal judgement

It was much easier to think of measures of performance in my professional practice than in my personal practice. But on the other hand more is at stake, for me, in my personal practice.

It follows from the dictionary definition that a practitioner is anyone involved in practice – in carrying out an action. If I reflect on my own practice, I am aware that what I do is not as simple as the interaction between practitioner and situation portrayed in Figure 3. I experience myself as something of a juggler trying to keep a number of balls in the air as I practise.

In this course we employ the metaphor of the systems practitioner as juggler and now I am going to focus on four particular balls we (the course team) think need to be kept in the air for any form of effective systems practice (Figure 4).



Key:

The **B ball** symbolizes the attributes of **being** a practitioner with a particular tradition of understanding.

The **E ball** symbolizes the characteristics ascribed to the 'real world' situation the juggler is **engaging** with.

The **C ball** symbolizes the act of adopting or **contextualizing** a particular approach to a new situation.

The **M ball** is about how the practitioner is **managing** their involvement with the situation.

Figure 4: For effective practice four balls (BECM) are juggled

Based on my experience, I claim that effective practice involves being aware that these four balls need to be juggled – it takes active attention, and some skill, to keep them all in the air. Things start to go wrong if I let any one of them slip. To be an effective practitioner, I find I have to continuously think about, and act to maintain, four elements: the processes of **being** a practitioner, my appreciation of the situation I **engage** with, putting the approach taken into **context** and **managing** in the situation. The four verbs, the activities, I am drawing your attention to are **being**, **engaging**, **contextualizing**, and **managing**.

The remainder of the course is structured around these four balls being juggled by a systems practitioner.

3.2 Making sense of the metaphor

The metaphor of the juggler keeping the four balls in the air is a powerful way for me to think about what I do when I try to be effective in my practice. It matches with my experience: it takes concentration and skill to do it well. But metaphors conceal features of experience, as well as calling them to attention. The juggler metaphor conceals that the four elements of effective practice often seem to be related. I cannot juggle them as if they were independent of each other. I can imagine them interacting through gravitational attraction, or the juggler can juggle them differently e.g. the E and B balls with the left or right hand as depicted in Figure 5. This allows me to say that in effective practice the movements of the balls are not only interdependent but also dependent on my actions.

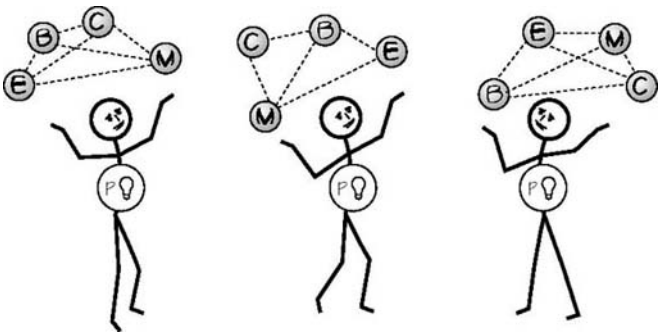


Figure 5: A metaphorical model of effective practice based on juggling four balls that are also interdependent

Activity 10

Write down your own initial impressions to the metaphor of the systems practitioner as juggler.

It might be helpful to explore what the metaphor reveals and conceals for you by relating it to one of the roles you have, or situations you have experienced. A spray diagram could be used.

4 Systems practice – unpacking the juggler metaphor

Systems practice, modelled in Figure 6, is a particular form of the general model of practice in Figure 3. An effective systems practitioner, P_s, is able to use systems approaches in managing complexity. I am not overly concerned with other approaches to practice, and will not be making any extravagant claims that a systems approach is better than other forms of practice. I will, however, develop arguments that enable me to make two claims.

1. Systems practice has particular characteristics that make it qualitatively different to other forms of practice.
2. An effective (or **aware**) systems practitioner (P_s) can call on a greater variety of options for doing something about complex 'real-world' situations than other practitioners do.

These are important claims. They will structure most of the argument made in the rest of the block.

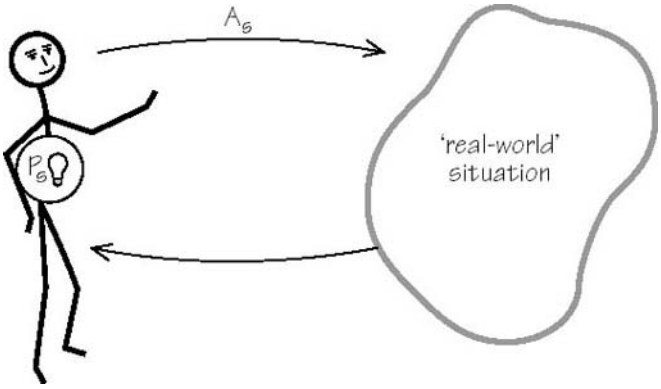


Figure 6: A general model for a systems practitioner, P_s, engaging with a 'real-world' situation using a systems approach, A_s and who reflects on their experiences

I intend to build up a picture of an ideal systems practitioner in stages rather than attempting it in one go. Juggling is a set of relationships. A juggler is a person, or living human being, in a particular context, with their body positioned so as to be supported by the floor and in this case they have four different balls. If any of these things are taken away, the juggler, the connection to the floor or the balls then juggling will not arise as a practice. In some situations an audience might also be important, especially if juggling for money. Taking away the audience would destroy the 'system', the interconnected set of relationships being envisioned. But there's more to this set of relationships then meets the eye. Take the juggler for example: she or he is both a unique person and also part of a lineage of groups of organisms called living systems. All living systems have an evolutionary past and a developmental past that is unique to each of us – a set of experiences which means that my world is always different to your world. We can never truly 'share' common experiences because this is biologically impossible. We can however communicate with each other about our experiences.

Many well-known systems thinkers had particular experiences, which led them to devote their lives to their particular forms of systems practice. So, within Systems thinking and practice, just as in juggling, there are different traditions, which are perpetuated through lineages (see Figure 7).

Activity 11

Tick off those blobs in Figure 7 which you have heard of or with which you are familiar.

Do a web search and bookmark some sites which relate to those blobs you have not heard about. Use any search engine to do this perhaps starting with the words or people named in the figure as key words. Some resources can be found on OU Systems websites.

Before finishing this introduction to the systems practitioner, I want to examine in more detail each of the balls being juggled.

The first ball the effective practitioner juggles is that of **being**. Juggling is a particularly apt metaphor in this regard because good practice results from centring your body and connecting to the floor. So juggling arises from a particular 'disposition' or embodiment. Effective juggling is thus an embodied way of knowing. Lakoff and Johnson (1999) argue that in the Western world, the most common sense view of what a person is arises from a false philosophical view, that of disembodied reason, that has influenced almost all of the professions. They contrast this with an embodied person (Table 1). For example in medicine until quite recently the brain was seen as quite distinct from the body – the mind-body dualism – whereas the brain is part of a much larger network that includes the nervous, endocrine and immune systems (e.g. Pert, 1997). It is for this reason that I have depicted the juggler with the light in their body rather than above their head. The light symbolizes embodied understanding.

Activity 12

List the two contrasting ideas from Table 1 that you find most challenging to, or supportive of, your current worldview. Explain why.

Answer

I think the last pair is the most challenging for me and others I encounter – not because I do not accept it on the basis of evidence emerging from over 30 years of cognitive science research, but because it is still difficult to talk about. My experience is that the majority of people take the traditional view so much for granted that the alternative is often dismissed before the conversation can begin. Recently my daughter's teacher responded in this manner in response to points she raised in an essay for her 'theory of knowledge subject' as part of her International Baccalaureate studies.

The second I find most challenging concerns 'conceptual metaphors'. The research conducted by Lakoff and Johnson and others suggest that through our evolution we have acquired a predisposition to structure the world in certain ways – and one of the most basic ways we do this is when we form categories. Let me exemplify this by referring to what they call the 'container metaphor'. One needs to think of this in terms of say a child's development from birth. For these researchers metaphors have an embodied basis, e.g. a child putting things in and out of any container is a basic experience; later this is internalized as in–out action patterns ('container' image schema) followed by literal language application of schema, e.g., 'Out of the box'; 'In my pocket'; 'Out of the cup'; 'In the fridge'. Then there is progressive metaphorical extension, e.g.

'Go into the house'
'I'm in bed'
'I'm in her class'
'They won't let me in their group'
'Keep it in the family'
'Within the terms of reference'
'An outsider'
'Exclusive restaurant'
'In time'
'In washing the window, I cracked it.'
'There are lots of houses in London'
'In love'
'Let out your bottled up anger'
'Fall into a depression'
'I put a lot of energy into this'
'Pick out the best theory'
'I give up – I'm getting out of the race'
'It finally came out that he had lied to us'
'My kind of person'

The implication of this explanation is that we do not engage in a process of universal reason which is independent of our biological history.

Being is concerned with embodiment, with our own awareness and thus our ethics of action, the responsibility we take as citizens. How a practitioner engages with a situation is not just a property of the situation. It is primarily a property of the background, experiences and prejudices of **being** the practitioner. So, in the next section I will focus on

some of the attributes of the practitioner. One of these attributes is **awareness**, awareness of self in relation to the balls being juggled and the context for this juggling. The nature of this awareness and what it means to be an aware practitioner will be explored.

The second ball is the E-ball – **engaging** with a 'real-world' situation. It is an engagement that can be experienced as messy and complex, or experienced as a situation where there has been a failure or some other unintended consequence. Or the 'real world' could be experienced as simple, or complicated or as a situation or as a system. Because I am primarily concerned with situations that are experienced as complex, I will call this engaging with complexity; later I will expand upon what I mean by complexity.

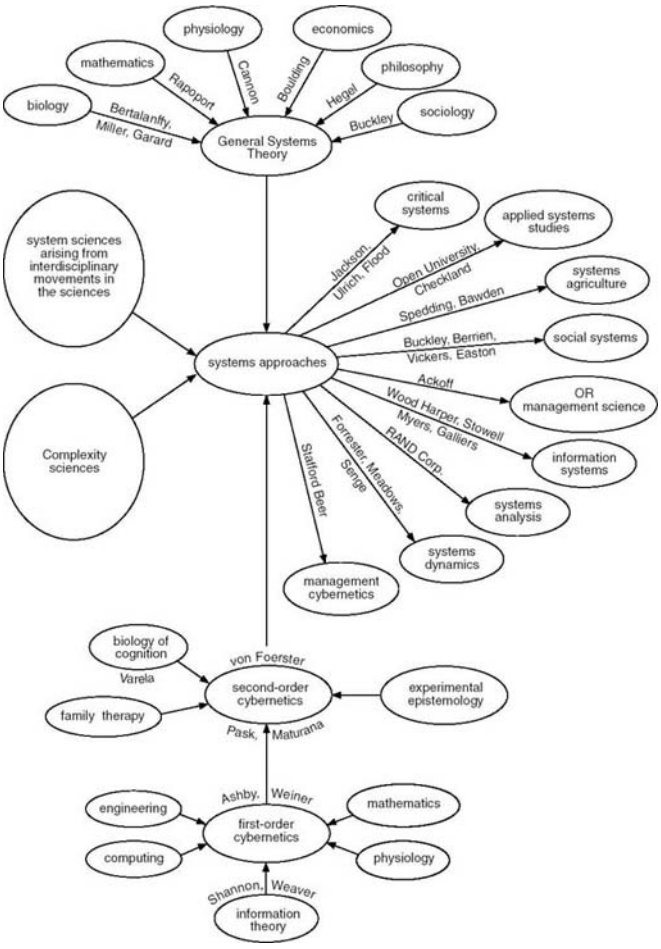


Figure 7: A model of different influences that have shaped contemporary systems approaches

Table 1 Some contrasting features between the traditional Western conception of the disembodied person with that of an embodied person

Traditional Western conception of the disembodied person	The conception of an embodied person
The world has a unique category structure independent of the minds, bodies or brains of human beings (i.e. an objective world).	Our conceptual system is grounded in, neurally makes use of, and is crucially shaped by our perceptual and motor systems.
There is a universal reason that characterizes the rational structure of the world. Both	We can only form concepts through the body. Therefore every understanding that we can have of the world, ourselves, and others can

concepts and reason are independent of the minds, bodies and brains of human beings.	only be framed in terms of concepts shaped by our bodies.
Reasoning may be performed by the human brain but its structure is defined by universal reason, independent of human bodies or brains. Human reason is therefore disembodied reason.	Because our ideas are framed in terms of our unconscious embodied conceptual systems, truth and knowledge depend on embodied understanding.
We can have objective knowledge of the world via the use of universal reason and universal concepts.	Unconscious, basic-level concepts (e.g. primary metaphors) use our perceptual imaging and motor systems to characterize our optimal functioning in everyday life – it is at this level at which we are in touch with our environments.
The essence of human beings, that which separates us from the animals, is the ability to use universal reason.	We have a conceptual system that is linked to our evolutionary past (as a species). Conceptual metaphors structure abstract concepts in multiple ways, understanding is pluralistic, with a great many mutually inconsistent structurings of abstract concepts.
Since human reason is disembodied, it is separate from and independent of all bodily capacities: perception, bodily movements, feeling emotions and so on.	Because concepts and reason both derive from, and make use of, our perceptual and motor systems, the mind is not separate from or independent of the body (and thus classical faculty psychology is incorrect).

(Source: After Lakoff and Johnson, 1999, pp. 552–557)

The third ball is concerned with how a systems practitioner puts particular systems approaches into context (i.e. contextualizing) for taking action in the ‘real world’; that's the juggler's C ball. One of the main skills of a systems practitioner is to learn, through experience, to manage the relationship between a particular systems approach and the ‘real-world’ situation she or he is using it in. Adopting an approach is more than just choosing one of the methods that already exists. This is why I use the phrase ‘putting into context’, to indicate a process of **contextualization** involved in the choice of approach.

The final ball the effective practitioner juggles is that of **managing** (the M ball). This is concerned with juggling as an overall performance. The term ‘managing’ is often used to describe the process by which a practitioner engages with a ‘real-world’ situation. This is a special form of engagement, so later I will explore some of the features associated with managing. Managing also introduces the idea of change over time, in both the situation and the practitioner.

There are clearly many ways in which being, engaging, and contextualizing are carried out, or could be carried out. Thus, when considering managing I shall be concerned with managing the juggling in ‘real-world’ situations experienced as complex.

I would urge you to keep Figure 6 and the juggler metaphor in mind when you are answering questions because a competent answer will always refer to the relationship between practitioner (you and your being), the approach you are envisaging given the nature of the situation as you and other stakeholders perceive it (i.e. your mode of engaging with a situation of interest), how you envisage adapting your practice to the circumstances (contextualizing) and how you plan to manage the overall activity.

5 Being a systems practitioner

5.1 The state of ‘Being’

The structure of Section 5 is set out in Figure 8. Use this as a way of keeping track of the argument I am making.

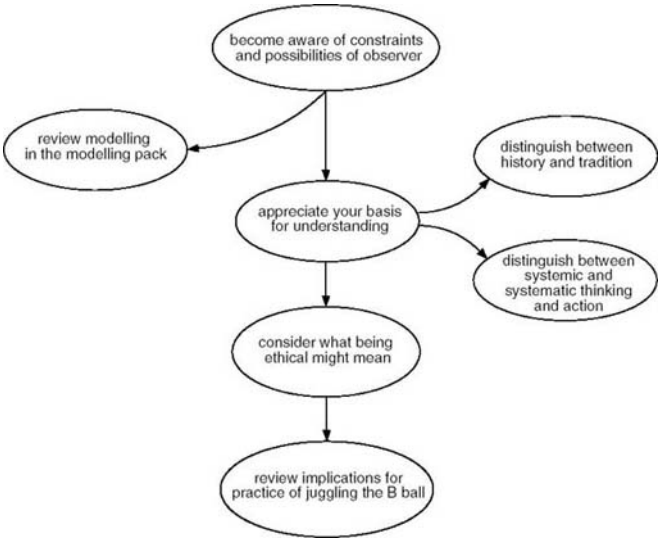


Figure 8: An activity-sequence diagram for Section 6: being a systems practitioner

Activity 13

Develop a table in your notebook with three columns. Put the verbs from each of the blobs in Figure 8 in one column. Jot down what they mean to you now in the next column and, at the end of your study of this section, jot down how your understanding has changed, if at all, in the third column.

Answer

You will need Figure 8 in front of you to complete this activity. The verbs listed in the table come from the blobs in Figure 8.

Verb	How I understand these activities now	How my understanding has/has not changed
Become aware of…		
Review…		
Appreciate …		
Distinguish …		
Distinguish …		
Consider….		

Review…

I am concerned with the juggling of the B ball in this section. As I write, I imagine this ball is shiny and thus acts as a mirror reflecting an image of the juggler. The properties of the juggler as systems practitioner come under the spotlight in this section. In choosing the word ‘being’ I am deliberately playing, metaphorically, with different meanings of being – one of which is, of course, ‘human being’. Some of the special features of being human include consciousness, language, emotions, and the capacity to reason or rationalize. It is also claimed that human beings live with a desire for explanations they find satisfying. You may have had the experience of a child repeatedly asking why?, how?, and then stopping after you have given a particular answer. The child finally finds your explanation satisfying – it makes sense within the child's world – and the child no longer needs to ask.

Perhaps you have experienced explanations that did not satisfy at all. If you are aware of this occurring did you note what it felt like? By this I mean, were you in touch with your emotions when you became aware that a particular explanation was satisfying or dissatisfying? By asking this question, I am saying it is legitimate to acknowledge your emotions – they are part of living and need not be ignored. I would go further and argue that an ideal systems practitioner is able to include an awareness of their emotions as well as their rational ideas. I find my Systems practice is enriched when I am able to access both.

5.2 Being aware of the constraints and possibilities of the observer

It is often claimed that the essence of a systems approach is that of seeing the world in a special way. This immediately prompts the question of what is meant by the phrase ‘seeing the world’. Because we live so intimately with the world of objects, categories and people and phenomena, we tend to think our own way of seeing the world is the only way, or even of thinking, ‘Well that is my view because the world is like that’. Actually, your view is special in several separate ways.

1. If your vision is not impaired, you see your surroundings using only light of wavelengths between 380 nm and 780 nm (nanometres or 1×10^{-9} m). Bees, for example, see flowers using wavelengths less than 380 nm. You have quite a small visual window on the world.
2. Research on colour perception in the 1960s showed that colour was not something that is fixed in the world, but is a property of our own unique histories. This led one of the researchers involved to change the question he was concerned with from ‘how do I see colour’? to ‘what happens in me when I say that I see such a colour?’
3. With normal hearing you hear frequencies of sound between 20 Hz and 20,000 Hz (Hertz). Bats use sound waves of higher frequency than 20 kHz, which we cannot hear.
4. Your ability to detect odours is vastly inferior to a dog's. A dog's ‘smell world’ is vastly richer than its visual world.
5. The language you have learned steers you into categorizing your world in ways you are largely unaware of, just as a fish is unaware of the water it is immersed in throughout its life. Sometimes it is possible to become aware of this when speaking

another language – when immersed in the other language the experience is sometimes like being a different person.

6. Your physiological state and the dynamic relationship of this with your emotional state also affect how you experience the world. This ranges from aspects of the functioning of your nervous system and its role in cognition, to hormonal events such as menstruation, and the release of natural endorphins during exercise.
7. The culture of the society in which you have developed has determined what you see as well as how you can respond in any flow of relationships. Your culture determines what is implicit in your perceptions and emotions. So the ways you see manners, relationships and behaviours is dependent in turn on how people around you see and act.
8. A special subset of the last point is the particular explanations we accept for things we experience. The 'theoretical windows' through which we interpret and act are always with us regardless of whether we are aware of them or not. Figure 9 provides a metaphorical account of this phenomenon. The theory or explanation you accept will determine what you see and thus the meaning you will give to an experience. Think here, for example, of the fundamentally different cosmology, the set of explanations for the origin and evolution of the universe, developed by the Mayan civilization in South America that was entirely coherent but so different to Western cosmology. This is sometimes described as the theory dependency of facts.

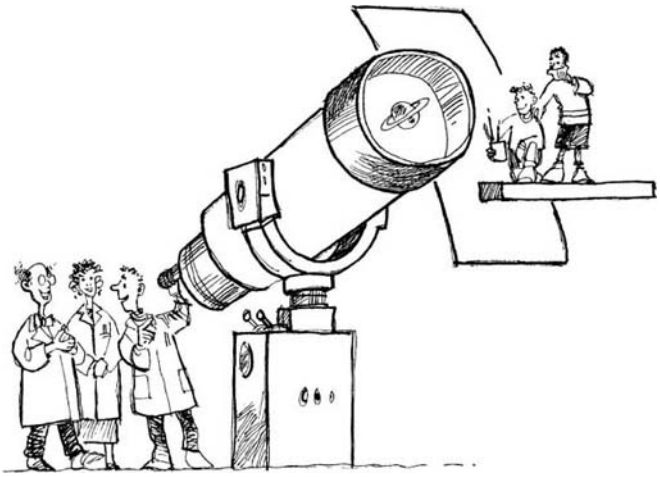


Figure 9: A metaphorical account of the way theories (planet on telescope) determine what we see in the world. The mischief makers in this example are the theory makers – their framing of the situation can determine what is experienced

Activity 14

0 hour(s) 10 minutes(s)

Checking out your own capacities as an observer.

Even now, your mind set – the way you see things – can be easily influenced. To see how this statement is true follow the instructions carefully.

If your last name begins with a letter between A to M, look carefully at Figure 10. Then look carefully at Figure 12.

If your last name begins with a letter between N to Z, look carefully at Figure 11. Then look carefully at Figure 12 .

Figure 10

Figure 11

Figure 12

If you are an A-to-M, you probably saw the young woman, and if you are an N-to-Z, you probably saw the old woman. Tests of these pictures, done with groups of students, show that prior influence is always powerful. This activity raises two important questions.

1. What is experience? In this example some people experienced a young woman whilst others experienced an old woman yet both looked at the same image. This leads me to claim that experience arises by making a distinction – if you are unable to distinguish a young woman then you have no experience of one!
2. Is it possible to decide on which interpretation, the young woman, the old woman or merely the ink on the paper, is correct? In other words do we reject those people who see only an old woman as being 'wrong'?

On the basis of doing Activity 14 try the next activity. Spend no more than about **10 minutes** on it.

Activity 15

0 hour(s) 10 minutes(s)

When you talk about experience what do you mean?

Describe what was, for you, a new experience.

For me the following story was helpful in making sense of what I mean by experience. I had the good fortune to do a consultancy in South Africa just after the first multi-racial elections. It was a time of goodwill and enthusiasm and general optimism. An incident happened towards the end of a flight from Johannesburg to East London in the new province of the Eastern Cape.

As the plane taxied up the tarmac towards the terminal, I experienced my South African colleague, in the seat next to me, as becoming agitated and tense. Looking out

the window, as he was, I could not distinguish anything that I could see as the cause of his distress. When I enquired, he pointed to some seemingly innocuous cement pillars, which he explained were the remains of gun emplacements left over from the state of emergency in the apartheid era. Because of his history, which was different to mine, he had seen what I could not see, that is his observation consisted of distinctions that I had not made. Furthermore, the distinctions my colleague made altered his mental, emotional and physiological state – they altered his being. My colleague made distinctions I was unable to make and thus he experienced something I did not.

The act of making a distinction is quite basic to what it is to be human. When we make a distinction we split the world into two parts: this and that. We separate the thing distinguished from its background. We do that when we distinguish a system from its environment. (Remember, using the word system is actually shorthand for specifying a system in relation to an environment.) In process terms, this is the same as drawing a circle on a sheet of paper. When the circle is closed, three different elements are brought forth at the same time: an inside, an outside and a border (in systems terminology, a boundary). In daily life we have developed all sorts of perceptual shortcuts that cause us to forget this is what we do – we live, most of the time, with our focus on one of these three elements: the inside, the outside, or the border. Biologically, we cannot focus on both sides of a distinction at the same time. Heinz von Foerster (1984) observed that the descriptions we make say more about ourselves than about the world we are describing.

While the old woman-young woman example is now well known, the implications that flow from it are not. The activity, and the points listed prior to that demonstrate that in the experience we cannot distinguish between perception and illusion and that ‘we do not see that [which] we do not see’ (Maturana and Varela, 1987). It is ironic that we pay money to go and see illusionists, and marvel at their artistry, yet remain unaware that illusion is also part of daily life. For systems practice this idea is challenging in a number of ways:

1. It draws my attention to what is involved in the process of **modelling**, of which diagramming is a subset. It raises the question of whether we model some part of the world or model our models of some part of the world.
2. It challenges the certainty of some practitioners who claim they are objective or they are right, and because of this, affects the way they practise.
3. It reminds me that my perspective is always partial and a product of my cognitive history (I would include emotions as part of a cognitive history). Thus, when forming a system of interest, the question of ‘perspective, who's perspective?’ is crucial.
4. It reminds me to be aware of the constraints and possibilities of the observer as I juggle the B ball in my practice.

The properties and role of the observer have been largely ignored in science and everyday culture despite Werner Heisenberg's finding in 1927 that the act of observing a phenomenon is an intervention that alters the phenomenon in ways that cannot be inferred from the results of the observation. This is the essence of Heisenberg's uncertainty principle, which limits the determinability of elementary events (von Foerster, 1994). The story of how the observer came into focus is an interesting one in the history of Systems and its associated field of cybernetics. Lloyd Fell and David Russell (2000) describe it in Box 1; its lineage can be seen in Figure 7.

Box 1 How the observer has come into focus

Cybernetics, although often applied to the control of machines, has long been one of the foundations of thought about human communication, its central notion being circularity. Cybernetics 'arises when effectors, say a motor, an engine, our muscles, etc., are connected to a sensory organ which, in turn, acts with its signals upon the effectors. It is this circular organization which sets cybernetic systems apart from others that are not so organized' (von Foerster, 1992). In first-order cybernetics it was the idea of feedback control which mainly occupied the practitioners, but in time the question 'what controls the controller' returned to view (Glanville 1995a,b) and the property of circularity became the focus of attention once again.

Second-order cybernetics is a theory of the observer rather than what is being observed. Heinz von Foerster's phrase, 'the cybernetics of cybernetics' was apparently first used by him in the early 1960s as the title of Margaret Mead's opening speech at the first meeting of the American Cybernetics Society when she had not provided written notes for the Proceedings. [The understandings which have arisen from second-order cybernetics…] requires a loosening of our grip on the supposedly certain knowledge that is acquired objectively, about a reality existing independently of us, and a willingness to consider the constructivist idea (see Mahoney, 1988) that we each construct our own version of reality in the course of our living together. The virtue of objectivity was that the properties of the observer should be separate from the description of what is being observed. This led to what von Foerster (1992) called the Pontius Pilate attitude of abrogating responsibility because the observer is an innocent bystander who can claim he or she had no choice. The alternative attitude, which seems to be less popular today, is to own a personal **preference** for one among various alternatives.'

(Fell and Russell, 2000)

Being aware of the constraints and possibilities of the observer enhances our repertoire of behavioural responses. Because we are able to communicate with one another, and because we live within cultures we can take shortcuts: it makes sense sometimes to act **as if** we are independent of the world around us. Sometimes it also makes sense to act as if systems existed in the world and as if we could be objective. But remember, the two small words **as** and **if** are important in the context of our behaviour when we attempt to manage. From the perspective developed in this section, it is always a shortcut when we leave them out.

5.3 Appreciating your basis for understanding

In my experience, the explanation that Fell and Russell suggest (i.e. that we each construct our own version of reality and therefore cannot be an objective observer; which in turn means we have to take responsibility for our observations and explanations) is challenging for many people. When I attend workshops where these ideas are expressed for the first time, people often become angry. You may be able to identify with them. If so, please try to use your discomfort productively for your own learning. It is profoundly disturbing to have the basis for your understanding of the world challenged. It seems important to do it, however, because in my experience, it gives access to new and practical explanations. I have already acknowledged you may find some explanations dissatisfying but, in the end, that is all they are – just explanations. If you don't find them

satisfying you need not accept them. Just the same, I invite you to look at them for a while before dismissing them.

Activity 16

Responding to the distinctions about the observer.

Find a way of expressing your emotional and rational responses to the material in Box 1 about the observer. One way could be to use your notebook to record these.

Relatively recent findings in cognitive science (e.g. colour perception), which are not widely appreciated, challenge some widely held 'common sense' notions. Take information for example. Many people assume that individuals would be better decision makers if they had better information. But how do we gain this information?

Since about 1950, the prevailing view in cognitive science has been that the nervous system picks up information from the environment and processes it to provide a representation of the outside world in our brain. This has been described as the information-processing model of the mind (Figure 13). We now know that the nervous system is closed, without inputs or outputs, and its cognitive operation reflects only its own organization. Because of this, we are imposing our constructed information – or our meaning – on to the environment, rather than the other way around. This is much like Figure 9, except this time the pattern of the planet is contained in our nervous system rather than the lens of the telescope. It implies our interactions with the 'real world', including other people, can never be deterministic; there are no unambiguous external signals.

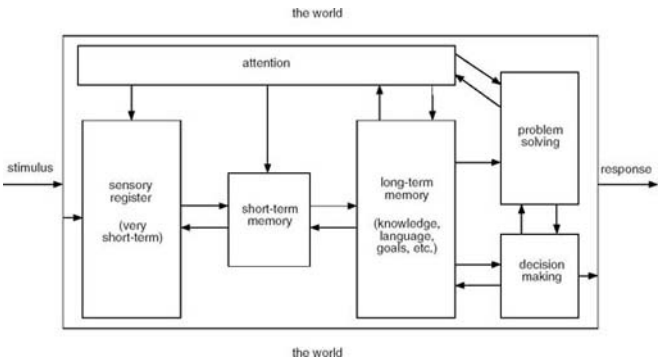


Figure 13: The prevailing but questionable information-processing model of the mind (Rosch, 1992)

Instead, our interactions consist of non-specific triggers, which we each interpret strictly according to our own internal structural dynamics (Fell and Russell, 2000). This has profound implications for how human communication is understood – it is not signal or information transfer but a process of meaning construction much as depicted in Figure 14 (but note, it is never shared as this cartoon depicts). Within this line of reasoning it is argued that we human beings exist, and are realized as such, in conversations. It is not that we use conversations; we **are** a flow of conversations. It is not that language is the home of our **being** but that the human **being** is a dynamic manner of being in language, not a body, not an entity that has an existence independent of language, and which can then use language as an instrument for communication.

For example when the word **nature** is used in modern Western discourse it is often used in such a way that leads us to live as if we human beings are outside nature. The concept

'nature' thus structures who we are and what we do. In some indigenous, non-western languages the term or concept does not exist. Obviously, this view has implications for what we mean by communication within systems practice.

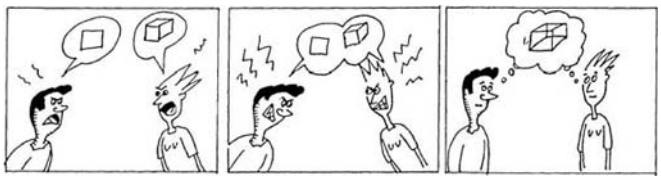


Figure 14: Human communication involves the construction of meaning (O'Brien, 1990)

The notion that we exist in language and co-construct meaning in human communication, much as dancers co-construct the tango or samba on the dance floor, suggests the need to consider on what basis we might accept that understanding has occurred. Asking this question is like opening a Pandora's box. It raises all sorts of questions that we take for granted, like: What is learning? What is understanding? How do we know what we know? Some of these questions are addressed in the next sub-section.

5.4 Experience – making distinctions based on a tradition and constructing a history

Experience, and learning from experience, will be a major theme throughout this course. The model of experiential learning developed by David Kolb is increasingly well known and used as a conceptual basis for the design of all sorts of processes from curricula to consultancies (Figure 15). In itself, the model is powerful but it does not address what is meant by experience or learning. In what follows, I want to provide a brief account of what these could be taken to be. My explanation is not mainstream, but arises from an appreciation of the constraints and possibilities of the observer described earlier and from the lineage labelled as second-order cybernetics in Figure 7.

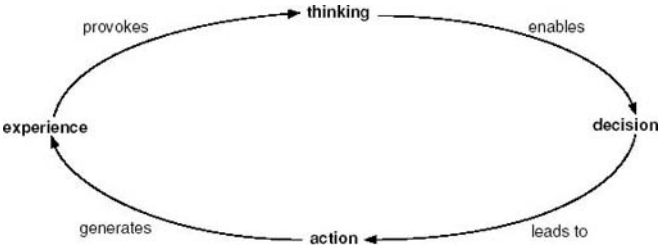


Figure 15 The experiential learning model adapted from Kolb which starts with experience.

Figure 16 depicts a person (a living being) over time; as unique human beings we are part of a lineage and our history is a product of both ontogeny, which means biological growth and development, and social development. Together these form what I will call a tradition. A tradition is the history of our being in the world. Traditions are important because our models of understanding grow out of traditions. The various shapes in the clouds above the practitioner's head in Figure 16 are used to depict how our model(s) of understanding change over time. The lightbulbs depict how, over time, we can become more aware of our embodied understandings, which in turn influences systems practice.

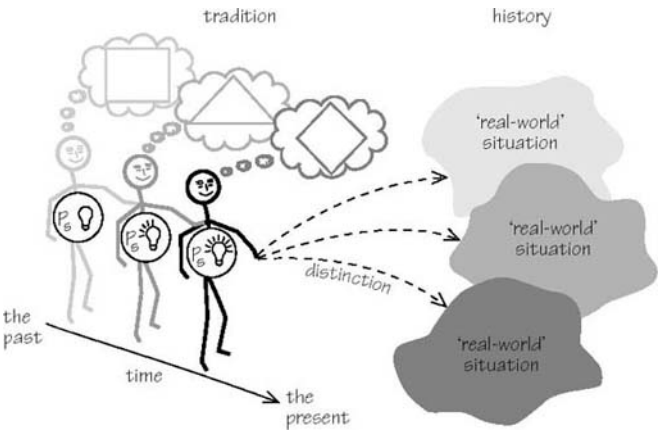


Figure 16: A model of a systems practitioner (P_s) growing in awareness (shown by lightbulbs) with a tradition of understanding (shown by the different shapes) engaging with a 'real-world' situation that has a history that can be explored.

I have portrayed 'a practitioner' with a prior model of understanding and a current model of understanding in Figure 16. From their current model(s) – it need not be one – the systems practitioner connects with a 'real-world' situation and makes a distinction. Based on this distinction, the practitioner can probe, or construct, the history of a situation.

Figure 17 is a refinement of the processes of being and engaging. I have now used the word tradition a number of times, including in Figure 17. I use the word in a specific way. I will call a tradition our history of making distinctions as human beings. Because experiences arise in the act of making a distinction, another way of describing a tradition is as our experiential history. To do this requires language – if we did not 'live in' language we would simply exist in a continuous present not 'having experiences'. Because of language we are able to reflect on what is happening, or in other words we create an object of what is happening and name it 'experience'

Let me try to explain what I mean in Figure 16 by considering the main fictional character Smilla, in Peter Heg's novel 'Miss Smilla's Feeling for Snow' (1994). Smilla was born and spent her early years in Greenland. Her mother was an Inuit and an expert hunter. Being half Danish, Smilla subsequently pursued a Western education that built on her earlier experiences. She became an expert in the qualities of ice and snow. It was her understanding of the many different qualities of ice and snow that enabled her to solve the murder of an Inuit child around which the story is built. Her understanding also enabled her to survive in the snow and icy water when pursued by the murderers.

As an author, Heg has grounded the distinctions Smilla is able to make about snow and ice in the history and culture of the Inuit people. Inuit culture is set against the background of continuous snow and ice. Survival depends on being able to 'read' the snow and ice in detail. This detail can reveal, for example, how long ago a wolf left its footprints and whether the ice will support the weight of a dog team. The distinctions the Inuit make assume their importance because of the actions they allow. They arise as embodied ways of knowing and acting in which knowledge is not separate from action. The distinctions Smilla, or other Inuit make, are not distinctions I could make except that, having read the book, I could claim to know about some of the different categories of ice and snow. But would I, in similar circumstances, be able to escape from the murderers and solve the case based on what I claim I know? The answer is no, because the distinctions Smilla makes are invisible to me; they are not part of my tradition. That would remain the case until such times as I was able to embody the distinctions about snow and ice quality and colour in my actions: for example being competent to run on snow without falling or to find

the kind of snow that can be built into a shelter. From this example, the only connection I can make with my tradition is that of ‘making categories’. In contrast to Smilla, this is a rather poverty-stricken form of knowing about snow!

SAQ 1

On what does Smilla's ability to distinguish different types of snow and ice depend? What would you have to do to develop a similar skill?

Answer

Smilla's ability to distinguish different types of snow and ice depend on her history of making distinctions, which I have called a tradition; meaning a pervasive network of understanding out of which, as an individual, she thinks and acts. It comes about because she grew up with the Inuit people and was introduced and socialized into their history of making distinctions about ice and snow. To develop a similar skill you would need to immerse yourself in the context of the Inuit and to make connections with their history, which you could embody in your actions. This would not be easy and would take time, just as learning a new language takes time.

Traditions are not only ways to see and act but a way to conceal (Russell and Ison 2000). Traditions in a culture embed what has, over time, been judged to be useful practice but there is a danger that they may become accepted practice (reified or institutionalized) in ways that no longer seem helpful. The risk for any culture is that a tradition can become a blind spot when it evolves into practice lacking any manner of critical reflection being connected to it. The effects of blind spots can be observed at the level of the individual, the group, the organization, the nation or culture and in the metaphors and discourses in which we are immersed.

A systems practitioner always engages with the ‘real-world’ situation by making distinctions which are grounded in his or her personal history of distinction-making. Based on the distinctions he or she makes, the practitioner can probe the history of the situation, much like an archaeologist, to reveal those dynamics which relate to the distinctions he or she has made. It is possible to connect with a particular history whenever we make sense of a distinction in relation to its particular historical context. For example, if you look at Figure 17 I suspect that you would have little difficulty making sense of the distinction ‘British dinosaur’ in relation to a history of symbolizing British culture through the image of a bulldog and the union flag.

Because much of my practice is based in academia, and because I often encounter situations in which proposals are considered uncritically, I have found it useful to engage with the history of particular practices that impact on me. Many good insights can be found in Neil Postman's book: *Technopoly. The Surrender of Culture to Technology* (1993). Of the many examples he cites, I was intrigued by the history of the practice of quantifying learning, that is, giving a mark or grade for academic work. Today it seems so much part of our daily life we do not question it. Yet prior to 1792, when it was first carried out at the University of Cambridge this was an unknown practice. Interestingly it was fostered mainly by military colleges.

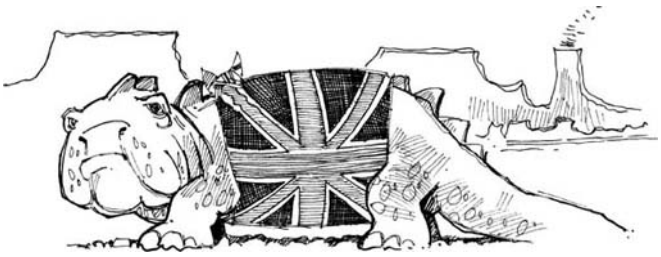


Figure 17: A British dinosaur: making a connection with an example of a particular history of symbolic representation

I call practices such as grading and examining, which become unquestioningly incorporated into a culture, social technologies – this is also what I mean by a practice becoming reified. All explanations also have a history, something which has become more apparent in recent years with the emergence of new academic disciplines in the history and sociology of science and technology. Explanations are also open to historical (re) interpretation.

So, after reading Peter Høeg's novel I can claim that I know about the different categories of snow by listing them. Perhaps after visiting Greenland with an Inuit guide I could claim that I know the different kinds of snow if I can distinguish them successfully. To claim I understand them would require me to be able to explain how, when and where different kinds are formed or found, and what implications they have for various activities, my own and other animals. In this latter two cases I need to ground the categories or distinctions within the historical context of the Inuit, much as I have tried to do in my brief description above. However I would need to do much more to embody these distinctions in my practices in the snow, that is to know, or practice in, snow. To know snow I would need to be able to claim that I have embedded my distinctions in a tradition – my own network of pre-understandings out of which I think and act. A test would be that under similar circumstances to Smilla my behaviour had similar results.

Of course, sometimes traditions collide!

Figure 18: When traditions collide. This is particularly the case when dialogue is not possible or is not sought.

Activity 17

Connecting with a history in your own context.

Consider one of your own role(s) and situation(s). With this in mind, are you able to think of a practice that is carried out unquestioningly? Are you able to engage in any

elementary archaeology to uncover some of the history of this practice? Do try this activity but do not worry if you are unable to identify one.

Answer

I have already referred to the history of quantifying assessment. This arose as a practice in the 18th century. Another example is the following which has been doing the rounds as an e-mail joke: perhaps you have seen it before but not considered it in the light of my explanation?

Horse's Ass

The U.S. Standard railroad gauge (distance between the rails) is 4 feet, 8.5 inches. That's an exceedingly odd number. Why was that gauge used? Because that's the way they built them in England, and the U.S. railroads were built by English expatriates.

Why did the English people build them like that? Because the first rail lines were built by the same people who built the pre-railroad tramways, and that's the gauge they used.

Why did 'they' use that gauge then? Because the people who built the tramways used the same jigs and tools that they used for building wagons, which used that wheel spacing.

Okay! Why did the wagons use that odd wheel spacing? Well, if they tried to use any other spacing the wagons would break on some of the old, long distance roads, because that's the spacing of the old wheel ruts.

So who built these old rutted roads? The first long distance roads in Europe were built by Imperial Rome for the benefit of their legions. The roads have been used ever since. And the ruts? The initial ruts, which everyone else had to match for fear of destroying their wagons, were first made by Roman war chariots. Since the chariots were made for or by Imperial Rome they were all alike in the matter of wheel spacing.

Thus, we have the answer to the original questions. The United States standard railroad gauge of 4 feet, 8.5 inches derives from the original specification (military specification) for an Imperial Roman army war chariot. Military specifications and bureaucracies live forever. So, the next time you are handed a specification and wonder what horse's ass came up with it, you may be exactly right. Because the Imperial Roman chariots were made to be just wide enough to accommodate the back-ends of two war horses.

5.5 Distinctions about systems practice

A tension has existed throughout the history of Western thought around whether to focus on parts or the whole. The practice that springs from this history carries the same tension. This tension has been particularly visible within science and philosophy for a long time and it gives rise to different approaches.

Emphasizing the parts has been called mechanistic, reductionist or atomistic. An emphasis on the whole has been called holistic, organismic or ecological. As Fritjof Capra (1996) notes: 'In twentieth century science the holistic perspective has become known as

"systemic" and the way of thinking it implies as "systems thinking".' Capra also claims systems thinking is 'contextual' thinking; and since explaining things in their context means explaining them in relation to their environment, I can also say all systems thinking is environmental thinking.

Two adjectives arise from the word system. Systemic thinking, thinking in terms of wholes, may be contrasted with systematic thinking, which is linear, step-by-step thinking. Likewise, it is possible to recognize systemic practice and systematic practice. Table 2 summarizes some of the characteristics that distinguish between systemic and systematic thinking and action.

Table 2 A summary of the characteristics that distinguish systemic thinking and action and systematic thinking and action

Systemic thinking	Systematic thinking
Properties of the whole differ, they are said to *emerge* from their parts; e.g. the wetness of water cannot be understood in terms of hydrogen and oxygen.	The whole can be understood by considering just the parts through linear cause-effect mechanisms.
Boundaries of systems are determined by the perspectives of those who participate in formulating them. The result is a system of interest.	Systems exist as concrete entities; there is a correspondence between the description and the described phenomenon.
Individuals hold partial perspectives of the whole; when combined, these provide multiple partial perspectives.	Perspective is not important.
Systems are characterized by feedback; may be negative, Analysis is linear, i.e. compensatory or balancing; or positive, i.e. exaggerating or reinforcing.	Analysis in linear.
Systems cannot be understood by analysis of the component parts. The properties of the parts are not intrinsic properties, but can be understood only within the context of the larger whole through studying the interconnections.	A situation can be understood by step-by-step analysis followed by evaluation and repetition of the original analysis.
Concentrates on basic principles of organization.	Concentrates on basic building blocks.
Systems are nested within other systems – they are multi-layered and interconnect to form networks.	There is a foundation on which the parts an be understood.
Contextual.	Analytical.
Concerned with process.	Concerned with entities and properties.
The properties of the whole system are destroyed when the system is dissected, either physically or theoretically, into isolated elements.	The system can be reconstructed after studying the components.
Systemic action	**Systematic action**
The espoused role and the action of the decision-maker is very much part of an interacting ecology of systems. How the researcher perceives the situation is critical to	The espoused role of the decision-maker is that of participant-observer. In practice, however, the decision maker claims to be objective and thus remains 'outside' the system being studied.

the system being studied. The role is that of participant-conceptualizer.	
Ethics are perceived as being multi-levelled as are the levels of systems themselves. What might be good at one level might be bad at another. Responsibility replaces objectivity in whole-systems ethics.	Ethics and values are not addressed as a central theme. They are not integrated into the change process; the researcher takes an objective stance.
It is the interaction of the practitioner and a system of interest with its context (its environment) that is the main focus of exploration and change.	The system being studied is seen as distinct from its environment. It may be spoken of in open-system terms but intervention is performed as though it were a closed system.
Perception and action are based on experience of the world, especially on the experience of patterns that connect entities and the meaning generated by viewing events in their contexts.	Perception and action are based on a belief in a 'real world'; a world of discrete entities that have meaning in and of themselves.
There is an attempt to stand back and explore the traditions of understanding in which the practitioner is immersed.	Traditions of understanding may not be questioned although the method of analysis may be evaluated.

Both systematic thinking and systemic thinking have their place. I am not in any way trying to set up an idea that systemic is good, systematic is bad. They are not in opposition in the hands of an aware practitioner. My own perspective, when managing or intervening in messy situations is that it is usually more appropriate to approach the task systemically. In other words, systemic thinking provides the context for systematic thinking and action. Thus my ideal, aware, systems practitioner is one who is able to distinguish between systemic and systematic thinking and is able to embody these distinctions in practice. This has implications for the initial starting conditions for any form of purposeful action – i.e. do I start out systemically or systematically? I take this up in Section 6 in terms of engaging with complexity in a given 'real-world' situation.

Of course, I am building an ideal model and day-to-day experience is different from this. No person can expect to become or embody the ideal overnight. It requires active engagement in a process of experiential learning. The other point I wish to make is that I am not equating the systems practitioner role with someone who is a professional consultant. This is a possible role, but in my idealized model the systems practitioner is anyone interested in understanding and taking action in any context.

SAQ 2

Being systemic or systematic.

Classify the following statements as reflecting either a systemic or systematic perspective. What are the implications of classifying these statements in this way?

1. My car is getting old and periodically refuses to start. When it does, I have to check a series of options and do some tests to discover what's causing the latest trouble.
2. There is no point in having a meeting to discuss this because the antagonisms within the department will dominate the situation and there are too few people interested in changing that.
3. I am being investigated by the Inland Revenue because my accountant made an error in calculating the dividend I received from the business last year.

4. The understanding of life is based on an understanding of DNA and how this is incorporated in genes.
5. As the managing director, I always found out what all participants in a disagreement thought and felt about what went on. Therefore, I could never blame any one person for the conflicts and messes that arose. I did my best to help each participant understand the others were taking a different view and had misunderstood aspects of the situation.

Answer

I think descriptions (1) and (2) exemplify systematic thinking. If I accept (1) for what it is, there is a step-by-step procedure that I know from experience will result in a successful analysis. For me, (2) and (3) exemplify simple cause-and-effect thinking, which in both situations could represent a trap. Description (4) is for me an example of systematic thinking that conceptualizes life as understandable in terms of basic building blocks, which can be understood by studying the properties of the blocks. Example (5) suggests to me someone who is thinking and possibly acting systemically. I say possibly, because I would like to check out the claims from perspectives other than the managing director's.

5.6 Learning and effective action

I claim that learning is about effective action. It is distinguished when I, or another observer, recognize that I can perform what I was unable to perform before. Following Reyes and Zarama (1998), I am going to claim learning is an assessment made by an observer based on observed capacity for action. From this perspective, learning is not about ideas stored in our mind, but about action. So what makes an action effective? Reyes and Zarama (1998, p. 26) make the following claims:

> Assessments change through history.[…] A major blindness we often observe in people is the almost exclusive attention they pay to learning particular skills as a way to become effective and successful in the future. However, they do not pay much attention to the fact that the standards to assess effectiveness in the future may be very different from the ones used today.[…] Actions by themselves never generate effectiveness. Only actions that comply with existing social standards can produce it.[…] A good example […] is the importance granted today to ecological concerns. Based on historical changes in standards of effectiveness, procedures that were considered extremely effective in the past are now discarded because they do not meet ecological standards.

This historical pattern of changes in what constitutes effectiveness is made in our social communications – it is referred to as discourses in the social sciences. Making judgements about effectiveness is something we do every day when we say, ‘He is a good footballer’, or, ‘She is a good manager’. Implicit in these statements are some measures of performance against which we judged effectiveness. I know from my own experience that my own standards of effectiveness are different to my daughter's when, after listening to a CD, I say, ‘She is a good singer’!

To be highly competent in practice, any practice, requires learning to be embodied – incorporated in the body itself. This is clear if we watch an Olympic hurdler or any other consummate athlete or performer. Every learning involves an alteration of the learner's body to perform the newly-learned actions. Thus, practice must happen. If I have an aspiration it is to be able to embody my systems practice. I think I have a long way to go, but I have experienced systems practitioners who meet many of the criteria of my ideal. There is, however one further element of being a systems practitioner that requires juggling.

5.7 Being ethical

As outlined in Table 2, ethics within systemic practice are perceived as operating on multiple levels. Like the systems concept of hierarchy, what we perceive to be good at one level might be bad at another. Because an epistemological position must be chosen, rather than taken as a given, the choice involves taking responsibility. The choices made have ethical implications. Within systematic practice ethics and values are generally not addressed as a central theme unless the practitioner is aware of the choice they are making. If there is no awareness, they are not integrated into the change process because the practitioner or researcher takes an objective stance that excludes ethical considerations. Recourse to objectivity can be a means of avoiding responsibility (see also Maturana, 1988).

My concern is with the ethics of systems practice. Heinz von Foerster (1992), citing philosopher Ludwig Wittgenstein claims that ‘ethics cannot be articulated’. Further, ‘it is clear that ethics has nothing to do with punishment and reward in the usual sense of the terms. Nevertheless, there must indeed be some kind of ethical reward and punishment, but they must reside in the action. Von Foerster goes on to consider the epistemological choice I outlined in Table 2 in terms of the following questions:

- Am I apart from the universe? Whenever I look, am I looking as through a peephole upon an unfolding universe? Or
- Am I part of the universe? Whenever I act, am I changing myself and the universe as well?

He then goes on to say:

> Whenever I reflect on these two alternatives, I am surprised again and again by the depth of the abyss that separates the two fundamentally different worlds that can be created by such a choice. Either to see myself as a citizen of an independent universe, whose regularities, rules and customs I may eventually discover, or to see myself as the participant in a conspiracy [in the sense of collective action], whose customs, rules and regulations we are now inventing.

The ethical way forward, von Foerster argues, is to always try to act to increase the number of choices available. By this he seeks in his own practices to act in ways that do not limit the activities of other people: ‘Because the more freedom one has, the more choices one has, and the better chance that people will take responsibility for their own actions. Freedom and responsibility go hand in hand.’ (von Foerster and Perkson, 2002, p. 37).

A practical tool for acting ethically is to be aware of the language used in a conversation. For example, by turning away from statements that begin with ‘That is the way it is’! To

enter a conversation convinced you are right or that your perspective is the only valid one limits the choices available to those who wish to pursue a conversation. Of course this does not mean you have to agree with the perspective on offer!

5.8 Reviewing some implications for systems practice

The following anecdote exemplifies one of the main reasons why I think juggling the B ball is important for systems practice. The story relates to two practitioners who were able to connect with the history of organizational complexity ideas. It describes the process they chose to take in response to a highly specific organizational-development tender document couched in traditional ways:

> Our first decision was to challenge the tender document.[…] When asked to present our proposals to the tender panel we ignored the presenter/audience structure in which the room had been arranged by drawing chairs up to the table and conversing with the client group. We began a discussion about the way those present were thinking about organizational and cultural change and emphasized the unknowability of the evolution of a complex organization in a complex environment. Instead of offering workshops or programmes we proposed an emergent, one step at a time contract […] to discover and create opportunities to work with the live issues and tasks that were exercising people formally and informally in the working environment. […] we were subsequently told that the panel's decision to appoint us was unanimous. (Shaw, 2002, p. 10)

When reflecting on this experience Patricia Shaw made the following comments:

> We were told by one of the directors, ‘Everyone else made a presentation based on knowing what to do. You were the only ones who spoke openly about not knowing while still being convincing. It was quite a relief’. Our success in interesting the client group in working with us seemed to be based on:
>
> 1. Making it legitimate in this situation not to be able to specify outcomes and a plan of action in advance, by so doing we made ‘not knowing’ an intelligent response.
> 2. Pointing out the contradictions between the messy, emergent nature of our experience of organizational life and the dominant paradigm of how organizations change through the implementation of prior intent.
>
> This approach helped to contain the anxiety of facing the real uncertainties of such a project together. It was an example of contracting for emergent outcomes.

What does this story tell us? It shows that how we think about the world; our theories and models are a result of experience, even if implicit, determine what we do in the world. Our theories predispose us to engage with ‘real-world’ situations in particular ways. Unlike the other consultants, Patricia Shaw and her colleague, did not respond to the tender as if it were a problem for which they had the answer. I have experienced Shaw in action, and think she has embodied her conversational theories in her actions.

This approach is potentially able to encompass all of the complexity in the situation. It is also able to bring forth the multiple perspectives through the engagement of all the actors in the situation. They used conversations, interviews and even drama to achieve this. This allows outcomes to emerge from the process rather than being defined in the form of a plan with outcomes specified in advance. Sometimes highly specific plans that are not renegotiated iteratively as the environment changes are called blueprints, and the process called blueprint planning. Shaw and her colleague approached their task as an unfolding process of 'engaging' in which all parties were learning or co-constructing new meanings in the situation (Shaw, 2002). Systemic approaches to managing complexity, of which this is an example, are designed to achieve emergent outcomes because they orchestrate a process of learning.

You will, of course, recognize that the behaviour of Shaw and her colleague is not appropriate in all contexts, although I think the approach could be used more. In the case of an engineer responding to some specific request that required precise technical specifications another response may have been appropriate.

Being aware or, becoming aware of our being, I argue, increases the repertoire of possible actions available to a systems practitioner. It is the first step on the journey from being to becoming. Being aware, or not, of the issues I have raised in this section creates the initial starting conditions for engaging with complexity, the subject of the next section.

SAQ 3

State the main ways you need to be self-aware as a practitioner. What are the advantages of each awareness, and what are the traps if you do not have each awareness?

Answer

The main ways of being an aware practitioner are:

1. By attempting to surface your traditions of understanding (these could also be called mental models; theories in use; frameworks of ideas) so that you can be aware of the choices you make in pursuing your practice;
2. By refining (a), you become epistemologically aware, and able to think and act systemically or systematically;
3. By appreciating the constraints and possibilities of the observer and how this awareness questions the commonly accepted notion of objectivity and replaces it with that of responsibility;
4. By seeking to embody your systems thinking in practice;
5. By adding an ethical dimension to your work, particularly by seeking to increase the choices available to stakeholders.

In Table SA1, I suggest some of the advantages of each awareness and some of the traps.

Table SA1

Way of being aware	Advantages	Potential traps when missing
surface traditions	you know what theory informs your practice	you remain unaware of your own prejudices

	you can actively choose new theoretical frameworks	you have theories that are not suited to the context
	allows surfacing and questioning of many hidden assumptions	
epistemologically aware	increases the choices you have as a practitioner	conflict (including passive aggression) arises when your truth claim (perspective) is asserted over someone else's
	alters your approach from one of discovering or describing systems to constructing or designing systems of interest	collaborative action is more difficult
appreciate observer	avoid mistaken reliance on objectivity	avoid taking responsibility for actions
	enables a richer appreciation of what is involved in human communication	avoid being ethical
embody systems thinking	you are more readily able to contextualize your practice, you can adapt it to novel situations	your actions are confined to the theoretical rather than constituting praxis (combining theory and practice)
	you appreciate the history of the situation in which you are practising	
incorporate ethics	is an act of being responsible	you take responsibilities for others without their agreement
	can increase the choices available to stakeholders	

Remember to return to the table you developed for Activity 13 in your notebook and note down any changes in understanding resulting from your study of this section.

6 Engaging with complexity

6.1 Articulating your appreciation of complexity

I have organized the material in this section so that you can follow the activity route shown in Figure 6.

This section is primarily concerned with what can be understood by the term complexity, and how to compare it with the ideas of **difficulty** and **mess**. To do this, you are first asked to notice your developing understanding of complexity in Section 6.1, and then to enter a deeper engagement with the distinction between difficulties and messes in Section 6.2. The substance of Section 6.3 is an exploration of the conceptual links between complexity and mess. It also alerts you to the many ways the term complexity is used, especially in relation to the new complexity sciences.

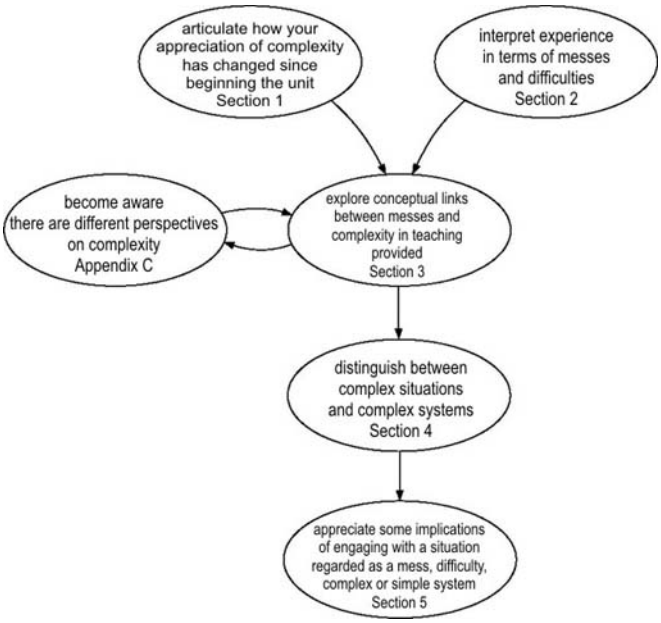


Figure 19 An activity-sequence diagram of the route through Section 6, which is concerned with engaging with complexity

The terms ‘complexity’ and ‘system’ each carry a rich set of meanings. As with complexity, the everyday senses of ‘system’ can get in the way of acquiring a rigorous understanding of its meanings in systems thinking and practice. Section 6.4 tackles this thorny issue and explores whether, and in what ways, a complex situation can be thought of as a complex system. Finally, the implications of adopting these distinctions are explored in Section 6.5. Your understanding of complexity should have developed quite a bit by the end of this section.

You can return here, and to Figure 19, as you work through Section 6. Doing so will help you maintain your sense of direction as you work through the ideas and arguments in this section.

Initially, I would like you to notice whether and how your appreciation of the phrase ‘managing complexity’ has changed since you started the course. As you work through Section 6 you will encounter a number of ways of thinking about complexity that may be

new to you, so it becomes important to record your developing understanding. To help you with this, return to your notes on Activity 2 in Section 1.2. Now complete Activity 18. You should take no more than **20 minutes** to complete this activity.

Activity 18

0 hour(s) 20 minutes(s)

Articulate your initial appreciation of complexity.

You chose to do a course entitled 'Managing complexity …'. Construct a spray diagram around the phrase 'managing complexity' by adding descriptions of the different meanings you gave to the phrase when you started the course. You will also need to draw on your answer to Activity 2 and, possibly, other activities in Sections 4–6. There may also be other relevant material in your notebook. If you are unable to articulate more than one or two meanings for managing complexity do not worry. Complete a spray diagram all the same, because I will be asking you to add to it as you go through this section.

Outline the experiences that led you to attribute the range of meanings to managing complexity shown in your spray diagram. For example, some of the meanings might be 'I read book x'; 'I work in this field where complexity means y'. Complete this by writing a paragraph or two.

Articulate changes in your appreciation of complexity

Add to your spray diagram any new meanings for managing complexity that have become apparent to you as you study the course. If you gain new insights into your earlier answers, add another set of branches to existing branches on your diagram. You can use the original diagram and add the additional information in a new colour.

Keep building up your spray diagram using different colours – or a scheme that suits you – as you work through this section of the course. As new meanings and insights become apparent, add them to your spray diagram. You may find at some time that you want to reorganize the diagram because new insights enable you to see 'managing complexity' in a different way. Add your diagram to your notebook.

6.2 Experiencing complexity as mess or difficulty

In this section, I want to take the ideas of mess and difficulty and explore them in the context of complexity. I want to determine how these ideas are connected, how significant the connections are and what the differences illuminate. I shall draw on the ideas of three writers: Schön, whose central theme is practice (e.g. Schön, 1983; 1987); Ackoff, who explores the characteristics of mess; and Rosenhead, who shows how different approaches to practice may be contrasted in terms that illuminate the distinction between difficulty and mess.

When reflecting on his own professional experience of engaging with complex situations, Donald Schön, author of *Educating the Reflective Practitioner* (1987) had this to say:

> In the swampy lowland, messy, confusing problems defy technical solution. The irony of this situation is that the problems of the high ground tend to be relatively unimportant to individuals or society at large, however great their technical interest may be, while in the swamp lie the problems of greatest

> human concern. The practitioner must choose. Shall he [sic] remain on the high ground where he can solve relatively unimportant problems according to prevailing standards of rigour, or shall he descend into the swamp of important problems? (p.28)

The metaphor of the swamp provides some useful images for this section, which is concerned with the problems and opportunities of the swamp. Schön argues that:

> all professional practitioners experience a version of the dilemma of rigour and relevance and they respond to it in one of several ways. Some of them choose the swampy lowland, deliberately immersing themselves in confusing but critically important situations. When they are asked to describe their methods of inquiry they speak of experience, trial and error, intuition or muddling through. When teachers, social workers, or planners operate in this vein, they tend to be afflicted with a nagging sense of inferiority in relation to those who present themselves as models of technical rigor. When physicists or engineers do so, they tend to be troubled by the discrepancy between the technical rigor of the 'hard' zones of their practice and apparent sloppiness of the 'soft' ones. People tend to feel the dilemma of rigor or relevance with particular intensity when they reach the age of about 45. At this point they ask themselves: Am I going to continue to do the thing I was trained for, on which I base my claims to technical rigor and academic respectability? Or am I going to work on the problems – ill formed, vague, and messy – that I have discovered to be real around here? And depending on how people make this choice, their lives unfold differently (1995, p.28).

In my view the argument Schön presents is simple: there are many domains of human activity where professionals fail to take action in situations of uncertainty, complexity, uniqueness and conflict or where past actions have had unintended, sometimes surprising and catastrophic, consequences. It seems to be a common human experience, for example, that a well-meaning attempt to improve a complex and problematic situation has the effect of making the situation worse in quite unexpected ways. Such situations also arise when experience is at odds with intuition about how things should behave or should be. This class of experiences is described as counter-intuitive understanding. The idea is explored further in Box 2.

Box 2 Counter-intuitive understanding – an example

In many parts of the world since the end of the Second World War planners and individuals have begun to live with the common sense, and simple view (thanks to the so-called laws of supply and demand) that increasing the supply of something will lessen demand for it, i.e. they are inversely related. However, recent experience shows that increasing the supply – both in number and capacity – of roads creates its own demand, i.e. that increasing supply increases demand. This phenomenon, known as the Pigou-Knight-Downs Paradox, is one in which positive feedback operates, at least until basic resources are totally used up or skyrocketing costs block the positive feedback. In southeast England it is possible to speculate that the incidence of gridlock, pollution effects and social effects such as road rage, as well as increased fuel costs are beginning to block positive feedback. This provides some explanation for why political parties found it possible in the 1990s to curtail road-building programmes. On the other hand, the car lobby is powerful. They are major employers, contributing to economic growth, as currently measured, and it is in their

interests to see the road-building programme continue as this also increases the demand for cars.

In the early 2000s English road building policies have, once more, been adopted as one solution to traffic congestion. Demand for new cars has also increased fuelled by a drop in their relative cost. One possible outcome is that **pollution levels per car decrease**, as newer cars are far more energy efficient, but that **aggregate pollution may stay the same or increase** due to the rising number of cars, increased number and duration of journeys – the latter exacerbated by increasing frequency of gridlock. Other forms of controlling demand such as the central London congestion charging have been introduced.

An intervention in a policy process designed to alleviate some critical need or process, may at first seem logical and intuitively correct, but may exacerbate the situation in the future. It is for this reason that representing systems of interest, particularly through some form of modelling which makes modes of thinking, particularly in terms of patterns of influence, or cause and effect, is at the core of most systems approaches for managing complexity.

Given that in many situations, unexpected and potentially disastrous events may occur, it makes sense to think about doing some things differently. Doing things differently requires changes in thinking and in the actions that result from thinking. Being prepared for, minimizing, or even avoiding unintended potentially disastrous consequences means engaging with complexity. The effect of not engaging with Schön's swamp is to run the risk of unintended consequences of unknown seriousness, even if the intervention seems the right thing to do. We risk doing the wrong things with greater and greater efficiency rather than establishing what is the right thing to be doing. Russell Ackoff (1995) claims that it is better to do the right thing imperfectly than to keep doing the wrong thing better and better.

The experiences that have led to claims that different ways of thinking and acting are required for managing complexity have been derived in many domains. Examples include:

> The computer press is littered with examples of […] information technology fiascos or near disasters. An example is the computer-aided despatch system introduced into the London Ambulance Service in 1992. The £1.5 million system was brought into full use at 07:00 hours on 26 October and almost immediately began to 'lose' ambulances.[…] the system reverted to […] manual methods on 4 November when the system locked up altogether.
>
> (Fortune and Peters, 1995, p. 33)

> One of the striking things about public policy […] is that so many of the most pressing problems are ones that cut across departments, cut across disciplines; issues like social exclusion, the environment, the family. [so] My fifth point is about thinking systemically. (Geoff Mulgan; ex Demos, Director PIU, UK Cabinet Office)
>
> (Mulgan, 1998)

> … one of the more remarkable aspects of British debate is how little analysis is made in […] systemic terms. (Will Hutton, journalist and former editor of *The Observer*, a London Sunday newspaper)
>
> (Hutton, 1995)

> I felt that a concern for and systematic study of the social and environmental aspects of technology was essential. Certainly environmental problems were approachable only by means of systemic and interdisciplinary methods and I felt convinced that any Faculty of Technology that did not concern itself with such problems could not claim to be either modern or responsible, whether socially or academically. (Geoff Holister, founding dean, Faculty of Technology, The Open University)
>
> (Holister, 1974, pp.149–152)

> Education for sustainability is the continual refinement of the knowledge and skills that lead to informed citizenry that is committed to responsible individuals and collaborative actions that will result in an ecologically sound, economically prosperous, and equitable society for present and future generations. The principles underlying education for sustainability include, but are not limited to, strong core academics, understanding the relationships between disciplines, systems thinking, lifelong learning, hands-on experiential learning, community-based learning, technology, partnerships, family involvement, and personal responsibility. (President's Council on Sustainable Development, USA, under the Clinton administration)
>
> (President's Council on Sustainable Development, 1996)

These quotations are used in relation to at least four different domains. These are situations associated with:

1. The use of information and communication technology to develop information systems;
2. Organizational arrangements and associated policies and programmes;
3. Approaches to learning in technology education and in education for sustainable development;
4. Practice – whether in conducting an analysis or being professional.

There are a number of responses available to Schön's invitation to descend into the swamp of messy, confusing problems. Russell Ackoff uses the term messes to refer to the swamp, and difficulties to refer to the high ground. You should already have encountered Ackoff s terms in your earlier study of Systems.

SAQ 4

Try to describe three features a practitioner might use to distinguish a mess from a difficulty. Is any one of these distinguishing features more significant than the others?

Answer

The three main features a practitioner might use to distinguish a difficulty from a mess are:

1. Messes are made up from a network of problems and opportunities that will be described differently by different people engaged in the situation. By contrast a difficulty will be described much the same, even from a diversity of perspectives.
2. The improvement in a mess is not just the sum of the improvements in its component parts. The improvements in a difficulty are easier to identify and describe and it is easier to identify how they came about.

3. Because a mess is a set of external conditions that causes dissatisfaction, a judgement about whether or not it has been improved, and by how much, will depend upon the perspective of the observer. The improvement in a difficulty will be generally agreed upon by observers from any perspective.

To deal with messes requires a holistic or systems approach, therefore it makes little sense to distinguish one feature as more important than another. A core concept at the heart of the idea of mess is, however, that of **emergence**, meaning the whole is greater than the sum of its parts.

Activity 19 should take about **15 minutes**.

Activity 19

0 hour(s) 15 minutes(s)

Refresh your understanding of messes and difficulties.

Read Ackoff's points about messes and difficulties in Box 3 below. Relate these points, and your previous understanding of messes and difficulties to the child support case study. From your perspective on the case study, are there aspects that appear to be difficulties and others that appear to be messes?

Make notes on these.

Box 3 Some features of messes and difficulties

1. A problem or an opportunity is an ultimate element abstracted from a mess. Ultimate elements are necessarily abstractions that cannot be observed.
2. Problems, even as abstract mental constructs, do not exist in isolation, although it is possible to isolate them conceptually. The same is true of opportunities. A mess may comprise both problems and opportunities. What is a problem for one person may be an opportunity for another – thus a problem can be an opportunity from another perspective.
3. The improvement to a mess – whatever it may be – is not the simple sum of the solutions to the problems or opportunities that are or can be extracted from it. No mess can be solved by solving each of its component problems/opportunities independently of the others because no mess can be decomposed into independent components.
4. Simple situations do exist that can be improved by extracting one problem from them and solving it. These are called difficulties and they are seen as exceptions rather than the norm in terms of decisions that are needed in environmental, organizational and other information-related contexts.
5. The attempt to deal with a system of problems and opportunities as a system – synthetically, as a whole – is an essential skill of a systems practitioner.

(Following Ackoff, 1974a,b)

Russell Ackoff first coined the term ‘mess’ in 1974. He did so in response to the insights of two eminent American philosophers, William James and John Dewey. These philosophers recognized that problems are taken up by, not given to, decision-makers and that

problems are extracted from unstructured states of confusion. Ackoff (1974a,b) argued, in proposing his notion of mess that:

> What decision-makers deal with, I maintain, are messes not problems. This is hardly illuminating, however, unless I make more explicit what I mean by a mess. A mess is a set of external conditions that produces dissatisfaction. It can be conceptualized as a system of problems in the same sense in which a physical body can be conceptualized as a system of atoms.

From this definition of mess, Ackoff recognized a number of features of messes and difficulties (Box 3) that, if one is aware of them, affect the way a practitioner engages with a 'real-world' situation (see Figure 3 again).

When you have refreshed your understanding of messes and difficulties and re-read Box 3 spend about **15 minutes** on the next activity.

Activity 20

0 hour(s) 15 minutes(s)

Explain some implications of treating a situation as a difficulty.

You have been asked by the relevant government minister to prepare five quick-fix actions he can take to improve the child support situation. As a systems practitioner you are reluctant to take this approach. Write a few paragraphs briefing the minister about the possible implications of treating the situation as if it were a difficulty rather than a mess.

I find it interesting that Schön and Ackoff both have a professional background in planning. It is not surprising therefore that they have made similar distinctions when describing, or accounting for, their experiences in the messy business of planning. For me, they exemplify the aware practitioner juggling all the balls I described in Figure 4. What these planners have in common is they recognize that if the situation is engaged with as a difficulty there will be an outcome that will be different than if the situation is engaged with as a mess. They also agree that the traditional problem-solving methods, which are often associated with fields such as operations (or in the UK, operational) research (OR), or 'scientific management,' become useable only after the most important decisions have already been made. In other words, a difficulty is first abstracted from the mess and then the difficulty is treated using a traditional problem-solving approach.

I have summarized some of the characteristics associated with traditional OR in Table 3. Characteristics of an alternative, ideal, approach to OR, envisaged by Rosenhead (1989, pp. 1–20) in the early 1980s, are included in the table. Surveys had shown a low level of satisfaction on the part of managers with OR and management science projects at the time Rosenhead suggested his alternatives.

Table 3 Characteristics of doing traditional operations research in comparison to alternatives that were suggested in the early 1980s

Characteristics of traditional OR	Alternative characteristics for OR
1 Problems and opportunities are formulated in terms of a single objective that can be optimized. Trade-offs are made by reducing variables to a common scale	1 Does not seek to optimize. Done by seeking alternative solutions that are acceptable on different dimensions without trade-offs

2 Has overwhelming data demands, which leads to problems of distortion, data availability and data credibility	2 Has reduced data demands because of integrating qualitative and quantitative data with social judgements
3 Subjected to demands of science (scientization), assumed to be depoliticized and that consensus exists	3 Strives for transparency and simplicity so as to clarify terms of conflict
4 People are treated as passive objects	4 People are regarded as active subjects
5 Assumes a single decision maker with abstract objectives from which concrete actions can be deduced for implementation through a hierarchical chain of command	5 Facilitates planning from the bottom up
6 Attempts to abolish future uncertainty and pre-take future decisions	6 Accepts uncertainty, and aims to keep options open for later resolution

(Adapted from Rosenhead, 1989)

One way of interpreting Table 3, is that Rosenhead regarded the traditional OR approach of staying on the high ground, of treating the 'real world' situations with which many practitioners engage, as made up of difficulties to be solved rather than messes to be improved. I find many similarities with the ideas in Rosenhead's table with the following observation attributed to Richard Dawkins (Plsek, 2001):

> If I hold a rock, but want it to change, to be over there, I can simply throw it. Knowing the weight of the rock, the speed at which it leaves my hand, and a few other variables, I can reliably predict both the path and the landing place of a rock. But what happens if I substitute a [live] bird? Knowing the weight of a bird and the speed of launch tells me nothing really about where the bird will land. No matter how much analysis I do in developing the launch plan … the bird will follow the path it chooses and land where it wants.

Which of these metaphors (the rock or the bird) do you think best describes the process of launching change in the Child Support Agency case study?

There are differences as well as similarities in the explanations the two planners (Schön and Ackoff) provide when they reflect on their experiences. Schön in particular, chose to focus on the characteristics of the practitioner. I referred to some of these characteristics in the section above on being a systems practitioner. Schön's ideas, among others, have already informed the approach taken in Parts 1 and 2 of this course.

Plsek, a change consultant based in the USA, used the 'rock-bird' story in an address to a UK National Health Service (NHS) Conference entitled: 'Why Won't the NHS Do As It Is Told?' The UK NHS is the world's third biggest employer after the Chinese Red Army and Indian Railways. Understandably many people involved in the NHS experience it as complex. In his presentation Plsek evokes different metaphors as means for the audience to make new distinctions. He contrasts the machine metaphor (as characterized by traditional OR in Table 3 and scientific management) with an alternative metaphor of **complex adaptive systems** (CAS) as exemplified by the bird in the rock-bird story (CAS is explained in Section 6).

Ackoff, in his definition of a mess as a system of problems and opportunities chose systems thinking as his strategy to make sense of the mess of the swamp. His strategy was to look for system within a mess as a means to do something about it. Please note I am not referring here to 'discovering' **the** system or **a** system but the **process** of

distinguishing one or many systems of interest in a context. The end product of the process of finding system within a mess is called **formulating a system of interest**.

Let me consider now what I think Ackoff was doing in terms of a practitioner juggling the E ball. In my terms, Ackoff was a systems practitioner (P_s) engaging with a 'real-world' situation that he could choose to recognize as either a mess or a difficulty using a systems approach (A_s). This leads me to ask a fundamental question: **are the characteristics of a mess part of the situation or a function of the choice the practitioner makes?** I will answer this question by grounding it in my responses to the case study.

If I use everyday speech to describe my initial experience of the child-support issue I say 'it is a mess', or 'it is really complex', or 'I find it hard to understand it all'. You will notice I have used the word 'it' each time, which suggests the existence of something, an entity, a 'real-world' situation with which I have engaged. The structures of the language I use tie me into a linguistic trap – the naming of an 'it' that is independent of my act of distinction. Getting out of this trap means finding a language that avoids the implication there is a pre-existing 'it' waiting to be noticed by me. As someone once said every noun obscures a verb!

The same could be said of thinking that there **is** a NHS which **is** a machine or **a** complex adaptive system. I can get out of this trap by claiming a mess or a difficulty arises in the distinctions that a practitioner makes in a particular situation. If this is the case, a mess or a difficulty is not a property of the situation but arises as a distinction made by a systems practitioner – someone aware of the conceptual distinctions between seeing a mess and experiencing a difficulty – engaging with a particular 'real-world' situation (see Figure 16).

If, on the other hand, my experience had led me to say, 'Oh, I know what the problem is – we just have to do X and that will fix things', then I would be implicitly seeing the issue as comprising a difficulty.

SAQ 5

Which of the following statements conform to the idea of formulating a system of interest?

1. I am fascinated by the solar system.
2. When I engaged with the issues surrounding child support, I thought it might be helpful to consider it as a system from a number of perspectives. For example:
   - As a system to reduce the social security budget;
   - As a system to secure the best future for children in lone-parent families;
   - As a system to ensure the non-resident parent contributes equitably to the raising of their children.
3. I am interested in making computer systems function more effectively.

Answer

Statement (2) best conforms to the idea of formulating a system of interest because it considers systems not as things out there in the 'real world' – as in answers (1) and (3) but as a useful way of thinking about – engaging with – complexity from different perspectives. Statements (1) and (3) have little to say about context therefore it is more difficult to consider how these might be reformulated as systems of interest.

Activity 21

Consider your own practices.

Consider your own practices in some recent situation(s) in the light of Figure 16 and the question I posed above:

- Are the characteristics of a mess [or a difficulty] part of the situation or a function of the choice the practitioner makes?

You might benefit from writing your answer in your notebook and returning to it as your own systems practice develops.

6.3 Where is the complexity and what is it?

When I reflect on my experiences of child-support, I attribute the properties of mess, complex, or hard-to-understand to the situation. So, are mess, complex, and hard-to-understand the same thing? If they are, why is the course called Managing Complexity, rather than, say, Managing Messes? A glib answer is you might not have been attracted to it because of the everyday meaning of mess. Yet another answer is that complexity is a rich term whose everyday meanings have been further enriched by the so-called new sciences of chaos and complexity .

Let me try to explore some of this rich set of meanings by briefly examining the computer world.

I do not regard myself as computer literate and I'm not particularly enthusiastic about computers, so when I encounter a story about which new software or technology will be the new find or dominate the market I experience the situation as complex. I do so because there are many actors in the situation. The issue has a global span. There is apparent or potential conflict, suggesting a range of perspectives on the situation. And the outcomes of these different technological trajectories are likely to have profound economic and social implications. When I use complex in this way – and it has been used in this way most of the time in the unit so far – I am speaking about **perceived complexity**.

John Casti (1994) said 'when we speak of something being complex, what we are doing is making use of everyday language to express a feeling or impression that we dignify with the label complex.' He also argues that the meaning we give to the word complex is dependent on the context. For Casti, the complexity of a situation or a system is not an intrinsic aspect of the situation or 'system' taken in isolation but 'a property of the interaction between two 'systems' where one of these is more often than not an observer and/or controller' (i.e. a person). So, in this explanation, complexity arises in the relationship between the observer and the observed. This is my response to the question in Figure 2. It is also another way to understand what is happening in Figure 3.

Although the language is different, the process I have just described is the same as the one I described earlier for messes. Perceived complexity arises because of our cognitive limitations **as well as** characteristics of the situation. Our embodied ways of knowing – individuals and the explanations they accept have different traditions and histories – lead to only seeing aspects of a situation never the whole as discussed in Section 6.

There is no viewpoint or perspective that can appreciate the full variety of a situation. It is from the recognition of these limitations that a range of systems approaches have been developed. But are there other ways complexity is currently used? The short answer to this is: Yes, lots.

There are in fact many explanations provided for what complexity is or is not. Someone who went to the trouble of counting in the early 1990s claimed to have found 31 different definitions. Five pages, many more than for any other concept, are devoted to aspects of complexity in the **International Encyclopaedia of Systems and Cybernetics**. This situation has arisen partly because in the 1990s the field of complexity science has emerged, made popular by the activities of the Santa Fe Institute in the USA; partly because of a series of popular books; and the association of complexity with chaos research (Gleick, 1987). Horgan (1996), a sceptic and critic, describes the academic field as ‘chaoplexity’.

A selected range of perspectives on complexity are provided in Appendix C. This appendix is background material if you want to explore the subject matter in more detail. It is not essential reading and can be extended by a search of the World Wide Web. I outline the context in which complexity science is evolving below.

I suggest you browse Appendix C now before moving on. As you read you may like to add to the spray diagram you began to develop as part of Activity 18.

Click on the 'View document' link below to read 'Some perspectives on complexity'

One of the main driving forces behind the current interest in complexity is the advent of computers and sophisticated non-linear mathematical techniques. Horgan claims these ‘will help modern scientists understand chaotic, complex, emergent phenomena that have resisted analysis by reductionist methods of the past’ (Horgan, 1996, p.192). He uses the following quote to exemplify some of the claims being made:

> Through its capacity to process what is too complex for the unaided mind, the computer enables us for the first time to simulate reality, to create models of complex systems like large molecules, chaotic systems, neural nets, the human body and brain, and patterns of evolution and population. (p.193)

In an essay entitled ‘The Lure of Complexity’, Steve Talbott (2002) asks whether claims that the study of complex systems, or complexity is a new scientific revolution are, instead, a ‘retrenchment and strengthening of the most serious limitations of traditional science’. He asks if in the drive toward generality and abstraction complexity theorists have lost the features of a qualitative science that refuses to sacrifice the phenomena to abstraction in the first place? For me, as a member of an Open University group that has been teaching and researching systems approaches to managing complexity for the best part of 30 years, many claims made by complexity theorists appear extravagant. (This is taken up in Appendix C.) While I do not wish to deny the potential unleashed by increased computing power and non-linear mathematical techniques, and thus the new questions that are being asked, my preference would be to situate these ideas in a historical context. If this were to happen, and those making these claims were to look into the traditions that give rise to these claims, there would be much to be learned – particularly about the

difficulties caused by a multiplicity of meanings embedded in one word as well as a lack of attention to the theory–practice relationship.

Given the wealth of ideas within the notion of complexity, is it possible to be clear what is meant by the terms complex situation and a complex system? Does a historical context illuminate this question? The next section, represented by the second blob on the main spine of Figure 19, explores these issues.

6.4 Choosing to distinguish between complex situations and complex systems

Within some of the lineages of systems thinking and practice (Figure 7), the idea that system complexity is a property of what is observed about some 'real-world' system, is known as classical or type 1 complexity. Exploring type 1 complexity, Russell Ackoff (1981, pp.26–33) claimed for a set of elements to be usefully viewed as a system, it was necessary that:

1. the behaviour of each element of the set should have an effect on the behaviour of the whole set;
2. the behaviour of the elements, and their effects on the whole set, should be interdependent;
3. however subgroups of the elements are formed, each subgroup should have the same effect on the behaviour of the whole and none should be completely independent.

Following in the footsteps of Ackoff, and with others, Schoderbeck *et al*. (1985) described the complexity of what they regarded as a real or physical system as arising from the interaction of:

1. the number of elements comprising the system, for example, the number of chips on a circuit board;
2. the attributes of the specified elements of the system, for example, the degree of proficiency of musicians in an orchestra;
3. the number of interactions among the specified elements of the system, for example, the number of neuronal connections in the brain;
4. the degree of organization inherent in the system, for example, the social arrangements in a beehive or an ants nest.

They regarded systems as ranging from living organisms to individual families and governments.

Type 1 classification was subsequently regarded as insufficient by other practitioners because it excluded any complexity arising from culture and from human behaviour. Nor did it encompass the complexity arising from the properties of the observer, as discussed in Section 5 (as exemplified by the language used in the list above these authors saw 'systems' as real entities existing in the world. Some contemporary authors make the same claims about CAS – this idea is explored in more detail later in this section.)

Systems theorists have in the past had to confront some of the same issues as complexity theorists began to confront during the 1990s. The issues they confronted can be put rather bluntly as a series of questions:

1. Do systems exist ‘out there’ in the so-called ‘real world’?
2. Do systems have certain properties, some of which can be described or classified as complex and some as simple?
3. Are systems distinguished by an observer in a context? Is systemicity, the quality of being a system, a choice made by an observer when they perceive complexity in a ‘real-world’ situation?
4. What can I learn about a situation I experience as complex by engaging with the situation using a process of inquiry that formulates systems of interest?

These are not questions that have definitive answers. The view I choose to adopt will, however, have implications for my systems thinking and my systems practice. Exploring the implications will assist in deciding what course of action will work best for any particular practitioner.

I have constructed Table 4 from the characteristics Casti (1994) claims are exhibited by simple and complex systems as well as those claimed by Plsek (2001) to characterize complex adaptive systems. The examples are also theirs.

Spend a few minutes reading through the table and then do the activity that follows.

The activity should take no more than about **15 minutes**.

Table 4 Characteristics ascribed to simple and complex systems and complex adaptive systems

Simple systems	Complex systems	Complex adaptive systems
Have predictable behaviour; e.g. a fixed interest bank account.	Generate counter-intuitive, seemingly acausal behaviour that is full of surprises; e.g. lower taxes and interest rates leading to higher unemployment.	The elements of a system can change themselves (this relates to notions of autonomy).
Few interactions and feedback or feed forward loops; e.g. a simple barter economy with few goods and services.	A large array of variables with many interactions, lags, feedback loops and feed forward loops, which create the possibility that new, self-organizing behaviours will emerge; e.g. most large organizations, life itself.	Complex outcomes can emerge from a few simple rules (this relates to initial starting conditions and the idea that complicated targets and plans may stifle creative and adaptive ability).
Centralized decision making; e.g. power is concentrated among a few decision makers.	Decentralized decision making – because power is more diffuse, the numerous components generate the actual system behaviour.	Small changes can have big effects and large changes may have no effect – i.e. non-linearity operates (e.g. in the UK a small band of lorry drivers interconnected by mobile phones almost brought the country to a standstill by blocking petrol deliveries to service stations).
Are decomposable because of weak interactions; i.e. it is possible to look at components without losing properties of the whole.	Are irreducible – neglecting any part of the process or severing any of the connections linking its parts usually destroys essential aspects of the system	Thrive on tension and paradox. (It is argued that healthy organizations exist on the edge of chaos – a region of moderate certainty and agreement).

	behaviour or structure. There are dynamic changes in the system and the environment.	
		Are embedded within larger complex systems, and are made up of smaller complex systems.

(After Casti, 1994, pp.271–273 and Plsek 2001)

Activity 23

0 hour(s) 15 minutes(s)

What properties are ascribed to an observed system?

In Table 4 above, Casti has ascribed the terms simple and complex to the word systems. Likewise Plsek has ascribed the words ‘complex, adaptive’ to the word system. In what ways do you experience the terms ‘systems’ and ‘complex’ being used by Casti and Plsek?

What implications might these categories have for systems practice?

Are you able to use any of Casti's or Plsek's categories to make sense of the Microsoft–Linux story described in Box 4?

How does your attempt at doing this activity alter in any way, if at all, your understandings of the terms ‘complexity’ and ‘systems’?

Answer

My purpose in writing this activity was to invite you to reflect on what it is that we do when we categorize anything. One way of reading this table is as a set of three categories each containing different category members. The mechanism employed in this categorization is to add an adjective in front of the noun ‘system’. So they are different categories of system. This is another example of the ‘container metaphor’ discussed in my answer to Activity 12 and it is the same process as developing a typology (see Appendix C). Of course this is something we do all the time but I do not think we reflect very often on the implications of this doing! I discuss the implications for systems practice in the text.

Click on the 'View document' link below to read Appendix C 'Some perspectives on complexity'.

The questions I posed in Activity 23 are, for me, extremely interesting but at the same time potentially confusing. The word complex is being used by Casti in some cases to mean the same as system, and some of the characteristics of complexity seem to be applied to system. The phrase complex system is common, as you can see in Appendix C, although the meaning attributed to it is often unclear in my experience. For example, it is unclear to me whether Casti is using system in its everyday sense or in the specific way it is used within the study of Systems to mean a system of interest to someone.

When I consider the examples used in Table 4 there is something qualitatively different about a simple barter economy and the phenomenon of lower taxes and interest rates leading to higher unemployment other than whether they can be described as simple or complex. Indeed, I would question whether it would be helpful to consider a barter economy as simple. Considering the quality of relationships and trust that might be necessary to sustain a barter economy it could be perceived as complex. This notion of

quality of relationship seems to me an important additional distinction that could be attributed to complexity over that provided in the earlier list of Schoderbeck *et al*. (1985) which tends to focus only on the quantity of variables or interactions.

In some circles it is now recognized that what some people call complex adaptive systems offer insights into human action by way of analogy or metaphor (e.g. Stacey, Griffin and Shaw, 2000). Stephen Rose (1997, p. 33–4) argues that analogy 'implies a superficial resemblance between two phenomena, perhaps in terms of the function of a particular structure'. An example is blood circulation in animals and sap flow in plants. Analogies can provide insight but also mislead – Rose (1997) asks 'Is it a help or a hindrance to regard the access memory (RAM) in my computer as analogous to memory in chicks or humans or is it merely a metaphor?' He also distinguishes analogies from homologies which imply a deeper identity that arises from an assumed common evolutionary origin (e.g. the bones in the front feet of a horse may be assumed to be homologous with the bones in the human hand). Each of these distinctions can be drawn into your systems practice if they help in making new distinctions. Each is a choice that can be made. From this perspective one way to engage with the idea of 'complex adaptive systems' (CAS) is as a metaphor to trigger new ways of thinking and acting e.g. lets consider the NHS **as if it** were a CAS.

It is also possible in practice to attribute systemicity to some of the examples in Table 4. It might make sense as part of my systems practice to look at the activity of paying taxes (in a particular context) as if it were a system, or a living organism as if it were a system, or even a complex adaptive system, or a fixed interest bank account as if it were a system. In doing this though, it is important to ask **who** is looking at these situations as if they were systems. In the 1970s and 1980s, this confusion began to be addressed in Systems practice. Unfortunately, some confusion remains even now. So, what is the best way to sort out some of this confusion?

6.5 Appreciating some implications for practice

I think for most people, the National Health Service would be experienced as a complex situation. If so this would be a good example of perceived complexity. Remember though, if you engaged with it as if it were a difficulty you would not describe the situation as one of perceived complexity. I could not call it a complex system unless I had tried to make sense of it using systems thinking and found, or formulated, a system of interest within it. This means I would have to have a stake in the issue – an interest. In systems terminology, I would need a purpose for engaging with the 'real-world' situation. When I do not have such a purpose in mind, I am using the word system in its everyday sense rather than in its technical, systems practice, sense.

The fundamental choice that faces both systems theorists and complexity theorists is choosing to see system or complexity either:

1. As something that exists as a property of some thing or situation; and that, therefore, can be discovered, measured and possibly modelled, manipulated, maintained or predicted; or
2. As something we construct, design, or experience in relationship to some thing, event, situation, or issue because of the distinctions – or theories – we embody.

There are profound differences between these two options, as I have tried to depict in Figure 20.

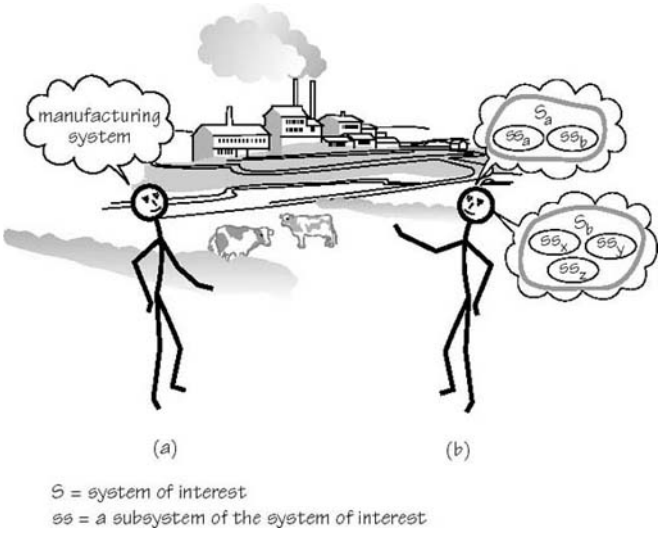


Figure 20: An iconic diagram of a systems practitioner who (a) sees systems in the world i.e. jumps to the conclusion that this is clearly a 'manufacturing system', and (b) one who is open to the complexity of the situation (factory, river, dairying) and sees systems as mental constructs formulated as part of a systemic inquiry.

These epistemological choices depicted in Figure 20 determine the nature of the engagement – the E ball – of a systems practitioner with a 'real-world' situation. The first choice says a lot about the nature of the thing or situation but says little about the practitioner concerned with the thing or situation. This is the situation where technical rigour, of the type described by Schön in his quote in Section 6.2 above, informs practice. Schön describes this as technical rationality in which there is a radical separation of research – and what is regarded within this epistemology as legitimate knowledge – and practice.

The latter position however, has a lot to say about the practitioner and about what they know and are able to do, as well as about their relationship to the thing or event they experience. In this situation the systems practitioner is engaged with the complex situation. He or she must construct or design alone, or with other stakeholders, the system of interest and choose to see the situation as complex or simple, mess or difficulty.

Taking responsibility for the choice you make about these two distinctions is an act of being epistemologically aware. The aware systems practitioner recognizes that a system of interest is an epistemological device, a way of creating new ways of knowing. The course is designed to help you develop your skills in being aware as part of your systems practice. At this stage, all you need to do is to note your reaction to my claim about being epistemologically aware. Do you recognize something of what I mean or does it seem quite meaningless and unnecessary? I anticipate both responses, so don't worry if you fall into the latter category. I have already introduced the basis for my position in this section.

Let me emphasize here, making a choice of one epistemological position or another in a given context is not an act of discarding or deciding against the other position – it is an act of being aware of the choice you made. Both positions offer rich explanations of phenomena in different contexts.

Activity answers

Study Note: As outlined in the text I have not provided answers to all Activities. This is for two reasons:

1. **For some activities only you can devise the answer and any I gave would be distracting or unhelpful**.
2. **For others in-text answers are given**.

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