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Systems Thinking and…

Messy Situations

I do not believe in things. I believe only in their relationships.

Georges Braque (1882 – 1963)

If you try and take a cat apart to see how it works, the first thing you have on your hands is a non-working cat.

Douglas Adams (1952 – 2001)

This paper puts the system into systems thinking. It builds on your own understanding of a system to create some powerful tools for thinking about messy situations. The idea of a system becomes a lens through which you can look at messy situations to discern simple structures for thinking about the mess.

What is a system?

I invite you first to ask yourself the following questions. You may be surprised by how much you already know about the amazing idea that we call 'system'.

- What does the word *system* mean to you?
- What are the characteristics of a system?

When systems-thinking professionals gather over drinks late at night they often express regret that systems-thinking pioneers didn't come up with a better word than *system*. It is a word in common use and so, they say, the 'more sophisticated' technical meaning gets confused with the common-usage meaning. Why, they lament, did the founding spirits of the systems movement not use a new word such as *holon*, the Greek word for a whole? I dissent from this view. The common-usage sense of *system* carries as much meaning as the technical sense. When I ask people what they understand by a system, even complete beginners come up with ideas which, taken together, have all the senses that 'experts' have in mind when they talk about systems.

Most groups come up with some or all of the following ideas when asked about a system:

- systems are collections of things connected to each other
- systems do something
- systems have subsystems assembled in hierarchies
- the whole is greater than the sum of the parts.

This list, derived from common-usage understandings, is almost complete. A working definition, acceptable to most experts, might be:

A system is a collection of elements connected together to form a purposive whole with properties that differ from those of its component parts.

The trouble with definitions of this kind is that, in the words of Peter Checkland, 'every word in it except the articles, the preposition and the conjunction is richly ambiguous'. If I accept the challenge implicit in this observation, I can illuminate the idea of system by discussing each key idea in the definition.

A collection

The *collection* of elements the definition refers to is not just a random assemblage – each element plays its part in the system. The system changes when one or more of the components is changed or removed or if other components are added. Thus, a physical system like a wrist watch (or the cat of Douglas Adams's observation above) changes, and may cease to be a system, when essential elements are changed. By contrast, a heap remains a heap – and a partial set of watch components remains a partial set – and does no more or less than heaps do when the set of component elements changes.

Elements

Elements covers a broad set of entities including ideas, concepts, activities, phenomena, organisations, processes and data, as well a physical objects.

Connections

Connections may be similarly diverse. In the case of physical systems with physical components, the components may interact directly or by pipes, wires or connecting rods through which materials, energy or data flow. Connections may also be conceptual, including cause and effect (A causes B), time sequencing (B follows A), contingency (whether B happens depends on A happening) and many others. Influence (A influences B) is always one of the connections between components of a system. This is a manifestation of the observation that adding, removing or changing a component changes the whole system. Each component connects to at least one other component while others may connect to many more components. Components may thus link into chains or into webs of interconnection.

Purpose

Systems are *purposive* – an observer observes an apparent purpose. In the case of designed systems, the system's purpose informs its structure, its workings and what it does. Other systems are capable of having purpose attributed to them. In other words, a system does not need to have a purpose intended by a designer. It just needs to *appear* to have a purpose to fulfil the definition of a system. There is more about this odd criterion in *Systems as doing something, having purpose and emergence* below.

A whole

A *whole* is simply something that seems to make sense as a single entity, even when, as a system, it is an assembly of components. This definition is a useful one, despite its apparent circularity. 'Seeming to make sense' is a powerful criterion in a messy situation. So, for example, a wrist watch makes sense (and qualifies as a system) in a way that half a watch does not. There is no word for 'half a watch' and this too indicates that half a watch is not a systemic 'whole'.

The sum of the parts

Aristotle was, perhaps, the first to notice that 'the totality is not, as it were, a mere heap, the whole is something besides the parts' (*Metaphysics*, Book 8) and this is a fundamental quality of a system. By connecting its component parts in a particular way, the system acquires qualities that simply do not exist if one of the parts is changed or connected differently. This quality is called *emergence*. Thus, watch components only become a watch, and acquire emergent time-keeping properties, when assembled in the right way.

The *properties* of the component parts often give no clue about the emergent properties of the whole. For example, oxygen is a colourless, odourless gas. Many quite stable materials become extremely flammable in an oxygen environment. Hydrogen is a 'lighter-than-air' gas that lifts balloons, embrittles exposed metals and burns with an invisible flame when ignited in oxygen. Hydrogen and oxygen combine chemically to form water, a colourless liquid that is essential to life, is refreshing to drink, dissolves salts of all kinds and flows musically along rills and over waterfalls. The properties of water, so different from the properties of hydrogen and oxygen, emerge when hydrogen and oxygen combine to form water.

The properties of systems

Messy situations, like systems, have multiple entities and multiple interconnections. The idea of a system can be a mental tool for creating a more orderly appreciation of a mess. If I think of a mess with its multiple elements and interconnections through the idea of system, I can begin to disentangle the elements from each other and begin to disentangle my appreciation of the mess. The properties of systems offer some tools for looking at and understanding a messy situation.

A system has some fundamental features, shown in the diagram (Figure 1) below:

- It has a *boundary* that defines the system as separate from its environment.
- It has an *environment* that is not part of the system but which influences the system and which the system influences.
- It has *subsystems*: systems within the system boundary that are part of the system and contribute to its purpose.
- Its subsystems have their own subsystems and the system itself is part of a larger system so that it is part of a *hierarchical structure*.
- Each subsystem has a specific *relationship* to other subsystems such that any change to a subsystem, or its relationship to other subsystems, changes the behaviour of the system as a whole.
- It has *purpose*, either by design or by attribution.
- It shows *emergence*, a property that makes the system different from a mere collection of the same parts.

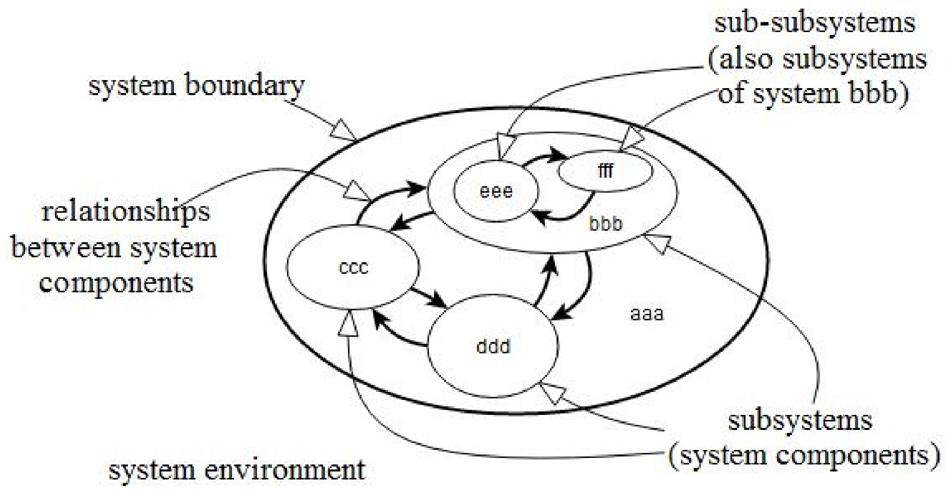


Figure 1: *The component parts of a system. The black arrows are part of the diagram and represent here 'connections between subsystems'. The white arrows are explanatory annotations and are not features of the system.*

Figure 2 shows an example of a system – the local postal-services system, seen from the perspective of a local resident. The system boundary separates the system from its environment. The environment has elements that are relevant to the postal system but not part of it. The postal system has a hierarchy of subsystems, sub-subsystems and sub-sub-subsystems. The map shows the postal system from the perspective of a domestic customer who receives and sends things through the system and so the inferred purpose is to provide sending-and-receiving mail services for the domestic customer. The subsystems, brought together in a coherent whole, provide the local postal infrastructure.

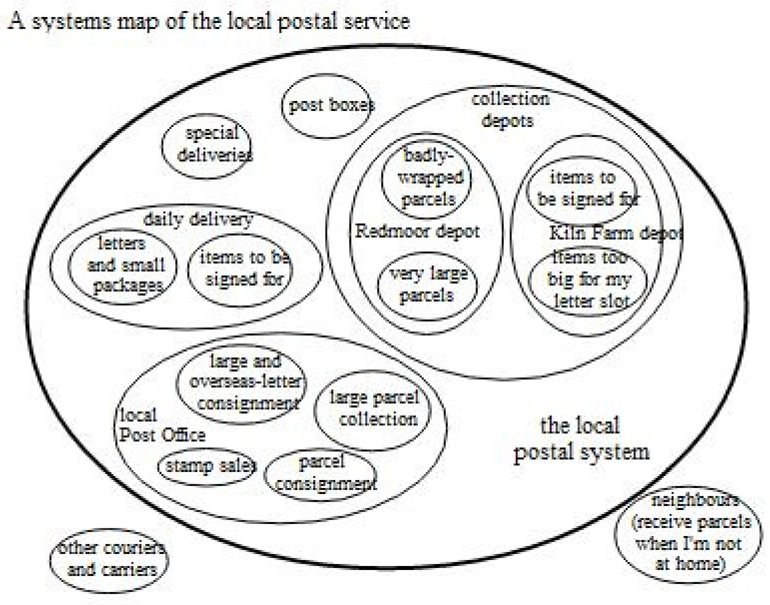


Figure 2: *A systems map of my local postal system. For a customer, the key features are local. (How an international postal service works is irrelevant to me.) It includes local and special deliveries and depots where items*

can be collected if normal delivery is impossible. Occasionally I use other couriers and carriers but they are not formally part of the postal system. Neighbours play an important role in receiving packages when I am out.

Each of the properties we have just identified – boundary, emergence, purpose, subsystems, relationship, system environment and system hierarchy – provides tools for thinking about messy situations and each is explored in the sections below. But first, an important question.

Do systems exist?

The language of systems assumes that systems are 'real', that they exist in the real world. While this may be true for a watch, it is less obviously so for an assembly of processes such as an airport's baggage-handling system. The system is an assembly of activities such as baggage drop, labelling, security checks, loading and unloading, scanning, transfers between aircraft and baggage reclaim as well as processes such as bag tracking that may happen thousands of kilometres from the bag itself. These activities happen but does the system 'exist' or is it simply a way of understanding that these activities work together to create a baggage-handling whole? This is an open question. The existence of such activities, including many of the same processes in large airports all over the world, suggests that the systems exist. If, however, we ask whether baggage-handling systems include processes for handling bags deemed a security risk or processes for handling accompanied pets, then the boundaries of the system become less clear and answers start to depend on what perspective one is taking.

The question is essentially a decision about how to think. In many contexts, such as engineering or other areas associated with physical artefacts, it is reasonable to work on the basis that systems exist in some verifiable way. In others, the *idea* of a system, used as a lens for understanding, gives a much richer appreciation of the situation. The idea of a system becomes a way of looking at the world. This latter position, the one taken in this book, looks for the properties of a system in, for example, a messy situation, and identifies clusters of entities, people, ideas or phenomena and then *chooses to see* the cluster as a system. Neither approach is right or wrong. The big difference comes from *noticing that there is a choice*. When I deal with a mess, the issue has less to do with the truth of whether any particular system exists but how I might think most effectively about the mess.

System boundary and system environment

As humans who name the things we observe in our environment, we get into the habit of assuming that the boundaries we place around the systems we name are also fixed. So, for example, in many organisations, teams or departments provide the organisational structure. People refer to Team X or the Marketing Department as if they were things one could see. But even in rigidly structured organisations, people from one department talk to those in another and information, both formal and informal, moves around the organisation so that getting things done often involves reliance on networks. Organisational restructuring often disrupts the informal networks that facilitate easy relationships between departments and teams, slowing business and inhibiting work flows. Conversations around the water cooler often inform strategic decisions by providing important background information. All this suggests that organisational structures limit thinking. An example from energy-supply shows how this can happen.

In the 1970s, the UK electricity industry was a state-owned monopoly. Efficiency and sales were the dominant factors in generating revenue. Fuel, distribution and waste-heat disposal were its principal costs. The industry was proud of its performance as an electricity generator and, as technology improved, it strove to increase its electricity-generation efficiency and its market share still further. Elsewhere in Europe, notably in Scandinavia, the Netherlands and Germany, different thinking was beginning to prevail. Power stations in these countries began selling waste heat from the electricity-generation process to local communities for home heating.

Waste-heat generation is an inevitable consequence of electricity generation, whether fossil fuels or nuclear fuels are involved and the UK landscape is dotted with the huge cooling towers that dump the heat into the environment. In mainland Europe, waste-heat output became a revenue opportunity, rather than an unavoidable cost. Cogeneration of heat and electricity slightly decreases the efficiency of electricity production but massively increases overall fuel-use efficiency from around 30 per cent to nearly 80 per cent. Electricity demand dropped as homes moved from electricity to waste heat for their heating but waste-heat sales became a major new source of revenue, more than balancing lost electricity sales. Electricity generators now saw themselves as part of the energy-supply system rather the electricity-supply system. In systems terms, the electricity generators of mainland Europe had seen beyond their electricity-generation system to a wider system that included their other main energy output, transforming the heat output from a waste product to a revenue-generating product. Figure 3 shows this boundary shift. Doing the wrong thing righter trapped the UK into higher energy costs while mainland Europe made massive savings in their fuel costs and greatly reduced their CO_2 footprint.

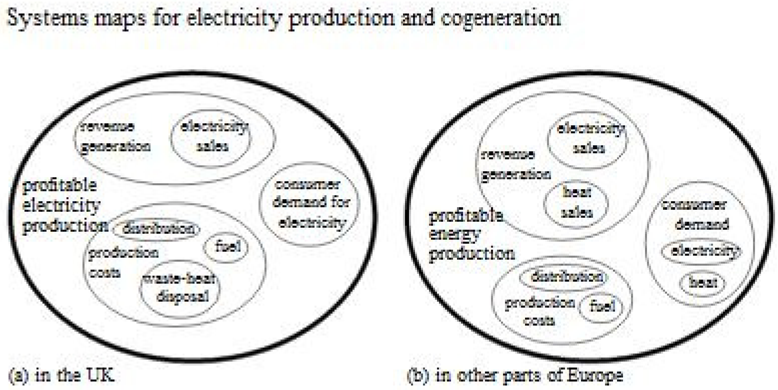


Figure 3: *By changing the boundary of the revenue-generation system to include waste heat, some European electricity generators opened a new market and transformed themselves from electricity producers to energy producers.*

There are two immediate ways of challenging boundary assumptions. The first is to shift your focus from structures to processes and activities, and the second is to widen your view. Thinking about your messy situation, ask yourself:

- Am I taking boundaries for granted?

  (Such an assumption often takes the form of attributing 'thing-like' status to entities that are not things as such. Such entities may be departments, accepted practices, 'systems' and groupings of processes or technologies.)

- What processes or activities are happening in the situation?

  How do these processes and activities connect, if at all?
  Does the situation have systems of processes and activities operating within it?
  (Looking for process-based systems usually provides an alternative understanding of the situation that overlays the more usual structure-based view.)

- What comes into view when I look at the context of something I take to be a system?

  (The system influences entities in its environment and they influence the system. Perhaps I should include them as part of a larger system?)

In answering all these questions, treat the idea of a system as a lens for understanding. The importance of this idea is that it sets you free from the need to discover the 'right' system. There is no right system when you use the idea of a system in this way. Two mediaeval stone cutters do exactly the same job. One believes himself to be in the business of cutting stones – part of a stone-cutting system. The other believes himself to be in the business of building a cathedral – part of a cathedral-building system. Asking which is right is meaningless – they both are. They see different boundaries. The immediacy of his task sets the first man's boundaries. The second man sets his boundary wider and, as a result, sees a wider, and possibly more meaningful, purpose in his stonecutting. Changing the boundaries changes the view.

A large company producing multi-media products was committed to meeting the needs of customers with disabilities as well as it met the needs of non-disabled customers. To this end, its Equal Access Team tailored the mass-produced products to the needs of customers with special needs. As the company acquired a reputation for its products' accessibility, demand grew and the Equal Access Team strove to keep up with demand. Despite improving their efficiency, they could not keep up. Their leader took on the challenge of confronting the company with the need to change the boundaries. He challenged the company to see accessibility as part of the whole process rather than the special task of one team outside the boundaries of mainline production. Accessibility became part of the production process for all the company's products. Designers, producers and marketers now saw accessibility as part of the process rather than an add-on. It created a new commitment to accessibility from people working on every stage of production. Accessibility was now inside the boundaries of the production process. The quality of service provided for customers with special needs improved as designers began to understand needs better and equal-access specialists began to understand the design process better.

Setting boundaries presents choices. There are no right answers to questions about the correct place for a boundary. In any situation, there are a number of satisfactory ways of setting a boundary, recognisable by their ability to help us make sense of the situation. In Figure 4, photos (a) and (c) make sense in ways that photo (b) does not and in many ways the art of setting boundaries around the systems we perceive is akin to the art of composing a good photograph. The practice – lots of practice – of experimenting with boundaries and making judgements about where to place them, illuminates new understandings of a situation. Systems maps, discussed later in this chapter, represent boundary judgements and the systems the boundaries define.

Figure 4: *Three ways of setting a boundary on a photograph. A photograph provides a useful metaphor for setting a system boundary. Photo (b) does not make sense because it does not depict a 'whole'.*

Structure, hierarchy and connectedness

Systems occupy a place in a hierarchy of systems and subsystems and a wider system environment. For example, if I look through a systems lens at all the issues involved in deciding about how to look after my elderly mother, I perceive a care-home system, a care-at-home system, a finance system, a shopping system and fragments of other systems. The finance system includes subsystems such as my sister's finances, my mother's income and her capital. These systems are the mental images of the system by which I can then think about the messy situation. Each subsystem is itself a system and provides a structure independent of any other connections between elements in the system. This means that each subsystem connects to the system above it in the hierarchy by a connection we can label 'is part of'. I could now look for features of the messy situation in these terms. So a 'County-Council care-homes' sub-system and a 'private-sector care-homes' subsystem would connect to the overall 'care-homes system' by being part of that system. The nested structure of systems helps me think more efficiently about complex and messy situations because it allows me to think simply without attempting to simplify the situation itself, perhaps by ignoring details that may be important. The systems I perceive through the lens of systems act as 'containers' for the details. I can examine the details if I need to but they are hidden, not lost, within the system while I am thinking about other features of the mess.

Exploring the deepest subsystems of detail has led to the extraordinary success of science since the Enlightenment of the 18th Century. So, for example, we understand a great deal about trees by examining the cell structure of their leaves, heartwood and bark, by observing how water and nutrient molecules migrate through the cells, by observing the interactions of molecules and sunlight that energise the tree's life processes and in many other detailed ways. More recently, there has been a resurgence of interest in holism – understanding that arises from moving up the system hierarchy that we use to frame our notion of 'tree'. This places the tree in the context of the wider habitat and brings other plants, animals, soil, atmosphere and water into focus. Systems thinking develops an ability to identify *systems of interest* – systems that have sense-making potential – somewhere in this hierarchy of nested systems. Systems thinkers move their attention up and down the hierarchy, engaging with the trees at many system levels to attain the understanding they need.

Systems as doing something, having purpose and emergence

The idea of a system that does something and has a purpose, whether designed or attributed, provides a powerful way of understanding some of the complexity within a messy situation. 'Snappy Systems' is a technique for breaking out of taken-for-granted understandings of what something is or does. Snappy Systems is simply a rapid (hence 'snappy') way of generating a list of different ways of seeing something as a system with a purpose. Snappy Systems works well even if only one person is making the list but it works even better with a group of people contributing ideas. This is an example of how it works:

I have a compost bin outside my kitchen door. Vegetable waste from the kitchen, small amounts of leftover cooked food, shredded newspaper and chicken poo go in and, after several months of activity by the resident worms, I can take out clean, non-smelly garden compost to enrich the soil. Phase 1 of Snappy Systems is simply to list all the systems you can think of, as fast and uncritically as you can, that describe the compost bin, by using the form 'A compost bin is a system to <do something>'. Write down every item of your list, even if it seems silly or irrelevant. Here is part of my list.

A compost bin is:

- a system to dispose of vegetable waste
- a system to create garden compost

- a system to save money
- a system to live sustainably
- a system to get something for nothing
- a system to improve soil structure
- a system to save energy
- a system to reduce the volume of garbage
- a system to reduce guilt about wasted food
- a system to make the garbage less gooey
- a system to provide a congenial environment for worms
- a system to cut down the number of garbage bags we use
- a system to recycle plant minerals.

This list was generated very quickly and without censoring anything. The only rule is to use verbs – action words – to define the system in terms of what it does. All the items suggest different ways of seeing the compost bin.

Phase 2 of Snappy Systems has two list-building stages. Firstly, list as many compost-bin stakeholders as possible. A stakeholder is anyone who might have a stake in – any reason for caring about – my compost bin. Again, working fast and without self-censorship is the key. My stakeholder list includes:

- me
- the garbage collectors
- the City Council
- the garden shop
- the worms in the compost bin
- the neighbours
- my family
- the worms in the garden
- flies.

Next, pick one of the stakeholders: it doesn't really matter which one but it may work better if their stake is rather different from your own. In this case, I would choose the City Council or the worms in preference to my family since the compost bin is a family enterprise and family stakes are similar to mine. Now repeat the Phase 1 process of listing systems but this time, do it from the perspective of your chosen stakeholder. Here is part of my list constructed from what I take to be the perspective of the City Council:

- a system to reduce the volume of garbage
- a system to minimise the smell of garbage
- a system to increase the combustible value of garbage
- a system to make garbage collection more pleasant
- a system to make garbage less tempting to foxes

- a system to reduce fly nuisance around garbage
- a system to make garbage drier.

I don't need to understand fully the Council's perspective on compost heaps in order to generate a much richer understanding of the wider context of my compost bin.

Phase 3 of Snappy Systems – Sinister Systems – is optional but especially useful for exploring why things go wrong. This time the ideas-storm concentrates on systems causing things to go wrong. In other words, each system in the list has the 'purpose' of creating unwanted effects. My compost bin rarely goes wrong but here are some of my sinister systems:

- a system to create a smell by the back door
- a system to attract flies
- a system to create nasty brown liquids
- a system to complicate vegetable-waste disposal
- a system to accumulate more compost than we need

Sinister Systems suggests the existence of systems I do not want and invites me to explore how they work and how to sabotage them in messy situations. It also alerts me to some possible unintended consequences of systems I identify.

Using Snappy Systems, and its variants, I begin to discern interlocking systems within the messy situation; the mess begins to acquire a structure. The idea that a system does something is closely allied to its purpose. 'Doing something' can be used as another way to clarify a messy situation by identifying systems within it. A system *transforms* something. The transformation it performs is the 'doing something' and is a key characteristic of the system. The system takes something in one state and transforms it into another state. This simple statement creates a tool, the ITO model, which challenges the user to be very clear and simple about what the transformation is. The ITO – Input, Transformation and Output – model is simply a diagram of a system transforming an Input into an Output. It is sometimes called an *input-output diagram*, although that term is less precise. The input is something in one state or condition. The output is the same thing in a different state or condition, transformed by the system. Figure 5 shows the generic ITO model and, below it, a 'toasting system' that transforms bread into toasted bread.

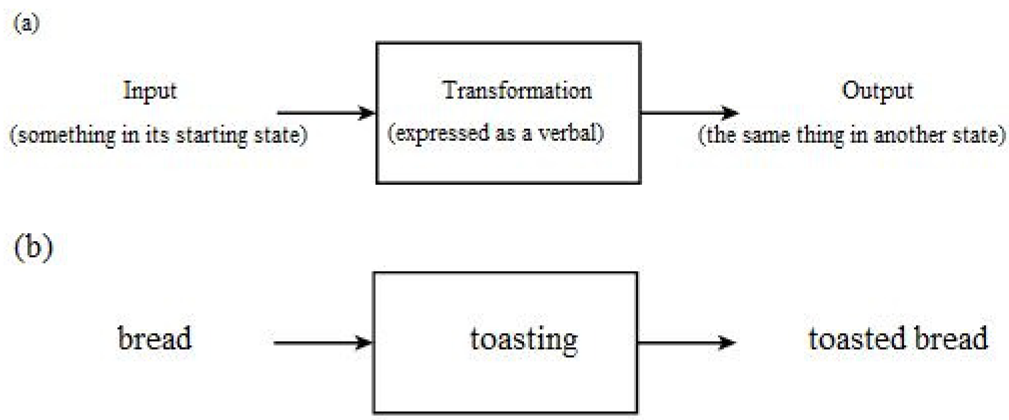


Figure 5: *A generalised ITO model of a transformation (a) where the state of an input (I) is transformed into another state (O) by the transformation (T). In an example (b), the bread in one state (untoasted) is transformed into toasted bread by the transformation. This allows me to identify the transformation as 'toasting'.*

The ITO model forces me to think clearly about two issues: 'What is really happening here?' and 'What essential transformation is needed here?' The model itself may appear trivial or overly simple but simplicity challenges my muddled responses to a messy situation.

Newcomers to the model are often tempted to think of inputs as 'ingredients' or process inputs. The ITO model is not a process model and so, for example, 'bread and electricity' is not an appropriate input for this model. It is important to stick to the specification of 'something in its starting state' for the input and 'the same thing in another state' as the output in order to identify the transformation. The forced simplicity may mean I need several ITO models to disentangle what is going on – another way in which the model forces clear thinking. For example, from my own experience, 'dealing with email' could be messy and suggested the need for a system that deals with email. When I tried to identify the inputs and outputs I noticed there were several different processes so that 'dealing with email seemed too vague. I came up with several ITO models:

Input	Transformation	Output
incoming emails unread	reading	incoming emails read
incoming emails unanswered	answering	incoming emails answered
outgoing emails unwritten	writing	outgoing emails written
outgoing emails unsent	sending	outgoing emails sent
read emails unsorted	sorting	read emails sorted
old emails undeleted	deleting	old emails deleted

Some people deal easily with email but, like many other people, I found that dealing with email was an overwhelmingly messy task that took time and energy. Using the ITO model, I discovered that the most demanding task was answering the incoming emails that needed responses. I devised a system for dealing with the read-only emails in the morning and responding to other emails later in the day, after I have had time to think about them. Deleting old emails was another task I found irksome, partly because, I realised, I am never sure when emails are truly finished with. I dealt with the issue by changing a system boundary. I now deal with old emails as part of my system for weekly computer back-up. I cannot claim that emails are no longer a problem but I achieved a major improvement and I expend much less time and worry on 'dealing with emails'.

Some transformations specified in an ITO model do not help very much. For example, *dealing with*, *managing*, *organising*, *coordinating*, *resolving* and several other verb-forms are too vague to clarify very much. The ITO model works best when the transformation is *active*. Ask, 'What would I see happening if I were to see this transformation in action?' and 'What gets changed?' A suite of activity-based transformations will be more useful than a vague, generic term like *organising*. Thus:

Input	Transformation	Output
office unorganised	organising	office organised
	becomes:	
documents not filed	filing	documents filed
dates noted on sticky notes	calendaring	dates entered in calendar
tasks on scrap paper	task-listing	tasks on things-to-do list

invitations received	responding	invitations responded to
tasks unscheduled	scheduling	tasks scheduled

Part of the power of the ITO model comes from its attention to *what* the transformation is rather *how* it happens. This enables an escape from the trap of existing, but inadequate, processes to focus on the essential transformation. In the email example, I transcended my unsatisfactory experience of ploughing through my emails one-by-one by creating new processes that achieved the same essential transformations in a more satisfactory way.

Two adjectives

Before moving on from the properties of systems, I want to make an important distinction between two adjectives, *systemic* and *systematic*. People often confuse the two and assume, mistakenly that systems thinking is about being systematic.

Systematic means *orderly, methodical and according to some system*. It often, for example, means taking a planned, step-by-step approach. 'He had a systematic approach to housework'. Systemic refers to the whole system. It often refers, for example to the whole body so that a systemic disease, such as flu, is one that afflicts the whole body as opposed to a non-systemic disease, such as a cold which is primarily an ear, nose and throat infection. By extension, in systems thinking, systemic is often used to characterise approaches that take a sceptical view of boundaries, taking account of a much wider picture and attending to relationships within and around an entity. Thus, a systemic approach to a problem will look beyond the problem to consider its context. Systems thinking may sometimes be systematic but is always systemic.

Systems maps

Systems maps show the structure of systems that I choose to make sense of a situation. Figures 2 and 3 showed systems maps. Systems maps show the boundary; the hierarchy of subsystems; and the system environment for a system of interest. They are essentially a snapshot. They carry no more information than a structured list but I can interpret them much more easily. Like any map, they represent only some features of the situation. They are helpful at the early stages of dealing with a messy situation because they enable me to clarify my thinking about the situation, to experiment with the boundaries I choose to work with and to focus at the right level in a hierarchy of systems. Systems maps are composed of labelled blobs and a title. They show systems and subsystems that belong together and to each other. They show no other interconnections.

Getting started

You will need a supply of large paper and marker pens or soft crayons that will make a bold mark easily. You will need several sheets so scrap paper is ideal. Sticky notes can also be helpful.

It may not be easy to discern where to start. 'Themes' and lists are helpful. An item from a Snappy-Systems list may also provide a starting point for a systems map. I usually start with a theme. This is simply a one or two-word noun-phrase label that fits a sentence like, 'There is a lot about <theme> going on in this situation.' I next list all the things in the situation that relate to the theme. The things may be people, ideas, processes, organisations, artefacts or any other kind of entity. If you have a rich picture of the situation, it will be a powerful resource for this process. I then start drawing a map putting things that seem to belong together in systems and subsystems. Constructing the list using sticky notes makes this easier. By writing each item on a separate note, I can move the notes around to create a prototype systems map on a wall or table-top. Thinking about how my sister and I could look after our elderly mother (mentioned earlier), the list we came up with was:

- my sister Viola's capital
- money to pay helpers for Mum
- financial institutions offering annuities
- Mum's capital
- Mum's income
- Mum's daily expenses
- capital tied up in the house.

It was not a complete list but it was a good start. I clustered things that seemed to represent 'Mum's resources' and worked from there. As I drew a subsystem called *Mum's resources*, I asked myself 'What else belongs in this subsystem?' and added some items not on the list. I asked similar questions about each subsystem and about the system itself. I did not use all the items on the list but it helped me start. After several false starts and six or seven drafts, each adding something to our understanding, I ended up with the systems map shown in Figure 6. It was an important breakthrough. For the first time, my sister and I had a clear picture of Mum's financial situation and what we should be planning for. It also alerted us to things we were less certain about – Mum received interest from several savings accounts and we were not sure where they were, how much money was in each account and whether they were the best accounts for Mum's needs and circumstances.

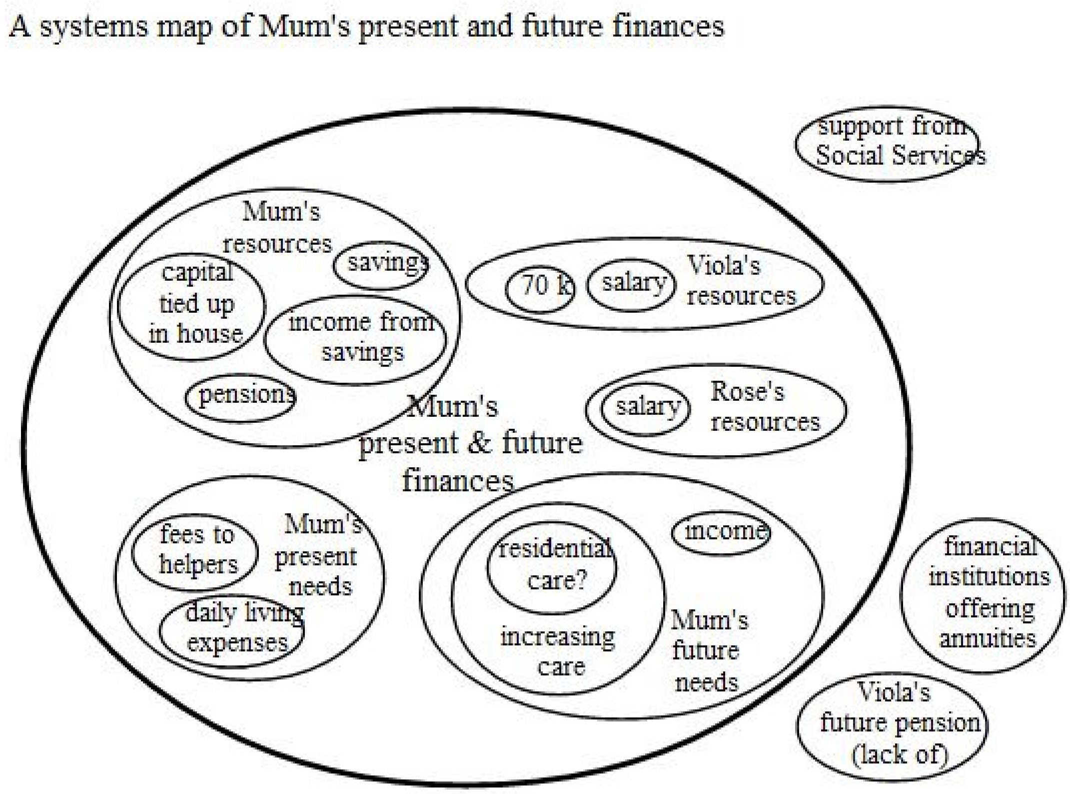


Figure 6: *A systems map I drew when my sister, Viola, and I were considering how best to support and care for Mum. The map drew on our identification of 'money' as one of the themes of the messy situation we faced and enabled us to understand the broad picture as well as the details of Mum's, and our own, financial circumstances.*

The map enabled us to have a conversation that might otherwise have been difficult. It was a 'mediating object' in the sense that we could say things about the map that were less easy to say about the situation. Viola had recently inherited some money and was wondering whether she should invest it on Mum's behalf. We included it in the systems map. It was immediately clear that we should postpone any decision about investing in an annuity for Mum until we had a much clearer idea of Mum's own resources. Finding out about Mum's resources became an 'important next task'. We made a provisional decision to hope that Mum could continue to meet her needs from her own resources, for the foreseeable future; to hope that revenue from selling the house would finance any care-home fees, should they be needed; and that, if necessary, we would contribute from our own salaries if that money were finally exhausted. This latter decision was a bit 'up in the air' but gradually settled into a more grounded plan over the next few weeks as we learned more about Mum's resources.

Rules

1. Blob lines represent boundaries
2. Every system and subsystem has a name
3. Systems that have important influences on the main system are shown outside the main system boundary
4. Blobs within the system boundary are subsystems; they may themselves have subsystems

5 Blobs may overlap only if some components are seen as common to both subsystems

6 A title identifying the main system is essential.

Guidelines

- Only one 'main' system – the system-of-interest – is included in the map. It has a bold outline.
- Use blobs rather than boxes. Boxes tend to imply clearly-defined systems. Such systems are rare in systems maps because the purpose of drawing a systems map is to create boundaries for poorly defined systems.
- Do not use overlaps more often than necessary. Although they are allowed by the rules, I almost never use them. When I am tempted, it is usually because my thinking is less clear than it could be. I prefer to rethink what I'm trying to draw.
- Ensure that subsystems within any system are all of the same type. For example, a systems map of a bike that includes a braking system, a power system, a steering system and a suspension system should not also include a subsystem of 'aluminium components'.
- Blob size is independent of the size or importance of the system it represents. It makes sense, however to ensure that important systems are centrally placed. Readers of your systems map may also infer that small blobs are unimportant systems.
- When grouping subsystems within a system, ask yourself, 'What else belongs in this system?'
- Don't overcrowd the systems map. Clear space creates room for last-minute additions and the map will be easier to read.
- Aim for no more than nine subsystems at any level within a system . If you find yourself wanting more than this, try grouping them into a subsystem.
- Aim for no more than four systemic levels in one systems map. If you need more, select a suitable subsystem and draw a systems map in which it is the system of interest. When drawing subsystems within systems within systems, try to avoid an onion-ring effect. You can see hints of an onion ring in Figure 6 where the 'residential care?' blob is close to the boundaries of its parent and grandparent systems.
- Most of the benefit of a systems map is realised in the drawing rather than the final product. Take notes about insights, questions, ideas and possible alternative maps. Redrafting is, in many ways, the whole point of drawing a systems map. Each 'failed' map clarifies your understanding of the messy situation.
- Expect the task to be challenging! Be of good cheer. The effort is usually worth it and, if not, it is good practice for the day when it *will* be worth the effort.

There is no single 'correct' systems map for any situation. It is a bit like cutting into a fruitcake – not all the elements of the cake will be visible in every slice. It is usually possible to produce several useful maps for any particular messy situation. Notice too that a systems map, like a snapshot, represents a particular perspective. My map of local postal services in Figure 2 is the perspective of a customer-resident. Someone working for the post office might have drawn a completely different map with subsystems representing collecting mail from post boxes, sorting, international transport, transport between cities, delivery and so on.

Be clear about whether your systems map is about activities or processes. Systems maps can represent either but get muddled if you confuse the two. Activities or processes can be hard to 'see' sometimes but as your understanding of a situation develops, a systems map of an organisation is usually far more revealing if the systems represent activities (product development, product design, product manufacture, marketing, selling, customer care, etc.) rather than departments. Purpose does not feature very strongly in systems maps.

I have learned not to add a title until I am close to finishing my systems map. Usually, my finished map is not the one I thought I was drawing when I started. The title should match the map!

Searching for system

The idea of a system allows me to simplify my thinking about a messy situation without pretending that the complexity of the situation is simpler than it is. Thinking about some of the features of a messy situation as though they were systems simplifies my thinking by providing a framework that accommodates the complexity without losing the details. You can use the properties of a system to structure your thinking about a mess. To recap:

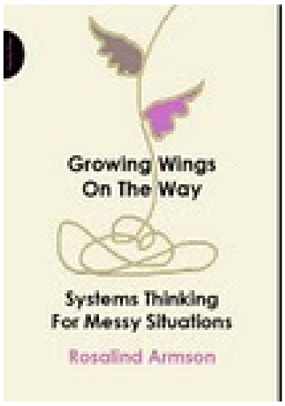
1. Use ideas of structure, hierarchy and boundary to draw systems maps. Look for things that seem to belong together or do something together. Alternatively start from a 'theme'. Make boundary judgements as you go but be prepared to start again as you change your mind. Re-drafting is a sign that you are developing your thinking and creating more understanding as you experiment with boundaries.
2. Identify purposive activity within the mess. Ask *Whose purpose?* and use Snappy Systems to explore alternative, and possibly contradictory, interpretations of purpose from your own, and other peoples', perspectives. Notice that purpose is inseparable from perspective. Use Sinister Systems to explore possible unintended consequences of activities and entities in the messy situation.
3. Identify transformations. Are they desirable transformations? Whose needs do they meet? What is entailed in the systems that do the transformations?
4. Make clear notes of all the insights, questions and ideas that emerge from this exploration. Be prepared for surprises as you search for elements of systemicity in the mess. You will discover things about the mess, about your own thinking about it and about other ways of seeing the situation. I cannot tell you what to look out for or where you will get to. Almost everyone who looks at their mess through the lens of systems gains delightful insights. You may be disappointed, however. The search for system may not work for you at this time. Don't worry. Try another set of ideas from another chapter.

Using the idea of system in messy situations

There is, as always, only so much you can learn from reading. Here is the challenge:

Have a go at drawing a systems map. Use a theme as a starting point and be prepared to just jump in. Keep redrafting until you are happy with it and make notes as you go.

Create Snappy-Systems lists of some of the key systems you identify and explore them from other perspectives. Identify some of the key transformations. Create ITO models for them. Include existing and wanted transformations, existing but unwanted transformations and transformations that might exist in an improved situation.



This ***THOUGHT PAPER*** is adapted from:

Growing Wings on the Way: Systems Thinking for Messy Situations by Rosalind Armson (Triarchy Press, 2011).

To read more about the book or to order a copy, visit:

www.triarchypress.net/growing-wings.html