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### Citation

Ison, Ray (2017). Systems Practice: How to Act. In situations of uncertainty and complexity in a climate-change world. 2nd Edition. Springer & The Open University.

### URL

<https://oro.open.ac.uk/51143/>

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# Chapter 4

## The Juggler: A Way to Understand Systems Practice

**Abstract** An ‘ideal-type’ model of systems practice is introduced through the device of an isophor/metaphor of the systems practitioner as juggler. It is argued that four balls need to be kept in the air for any form of effective systems practice. These are (1) the B-ball which concerns the attributes of Being a practitioner with a particular tradition of understanding; (2) the E-ball which concerns the characteristics ascribed to the ‘real-world’ situation that the juggler is Engaging with; (3) the C-ball which concerns the act of Contextualising a particular approach to a new situation, and; (4) the M-ball which is about how the practitioner is Managing their overall performance in a situation. An account by Donella Meadows of her own systems practice is introduced as a reading to explore the juggler metaphor.

### 4.1 Introduction of the Juggler

It follows from the dictionary definition that a practitioner is anyone involved in practise – in carrying out an action. But as outlined in the previous chapter practice can be understood as a series of elements that are combined to produce a type of performance. If I reflect on my own practice, I am aware that I have a myriad of factors to consider in any given day. What I do is not a simple interaction between practitioner and situation. I experience myself as something of a juggler trying to keep a number of balls in the air as I practise. As a device for learning I am going to employ the isophor of the systems practitioner as juggler to explore how systems practice arises through certain relational dynamics. I will focus on four particular balls I think need to be kept in the air for any form of effective systems practice (Fig. 4.1).

Based on my experience, I claim that effective practice involves being aware that all of 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 we let any one of them slip. To be an effective practitioner, I find it necessary to continuously think about, and act to maintain, four elements: the processes of being a practitioner, the means we engage with a situation, putting the approach taken into context and



**Fig. 4.1** For effective practice, what I have distinguished as four balls are juggled. The B-ball symbolises the attributes of Being a practitioner with a particular tradition of understanding. The E-ball symbolises the characteristics ascribed to the ‘real-world’ situation that the juggler is Engaging with. The C-ball symbolises the act of *Contextualising* a particular approach to a new situation. The M-ball is about how the practitioner is *Managing* their involvement with the situation

managing my own involvement in the situation (Fig. 4.1). The four verbs, the activities, I am drawing your attention to are *being*, *engaging*, *contextualising* and *managing*.

Practice, which is a systemic dynamic, can only be realised through actions, hence my focus on verbs, rather than say nouns. For example, I could have chosen, but rejected, descriptors such as (1) the process, (2) the approach, (3) the context and (4) the manager.

The isophor of a juggler keeping the four balls in the air is a way to think about what I do when I try to be effective in my own practice. It matches with my experience: it takes concentration and skills to do it well. But all isophors, just like metaphors, conceal or obscure some features of experience, while calling other features to attention. The juggler isophor obscures that the four elements of effective practice are related. I cannot juggle them as if they were independent of each other. I can imagine them interacting with each other through gravitational attraction even when they are up in the air. Further, the juggler can juggle them differently, for example tossing the E ball with the left hand and the B ball with the right hand. These visualisations allow me to say that, in effective practice, the movements of the balls are not only interdependent but also dependent on my actions. Also, when juggling you really only touch one ball at a time, give it a

suitable trajectory so that you will be able to return to it while you touch another ball. So it's the way attention has to go among the various domains, a responsible moment of involvement that creates the conditions for continuance of practice.<sup>1</sup>

I'll describe each ball briefly here, and then in the next four chapters expand on the praxis that particularly relates to each. But first let me explain what I mean by an isophor and how it differs from a metaphor. Humberto Maturana who invented the word 'isophor' explains what he meant in the following way:<sup>2</sup> 'The notion of metaphor invites understanding something by proposing an evocative image of a different process in a different domain (e.g., politics as war). With the metaphor you liberate the imagination of the listener by inviting him or her to go to a different domain and follow his or her emotioning. When I proposed the notion of isophor... I wanted it to refer to a proposition that takes you to another case of the same kind (in terms of relational dynamics) in another domain. So, with an isophor you would not liberate the imagination of the listener but you would focus his or her attention on the configuration of processes or relations that you want to grasp. In these circumstances, the fact that a juggler puts his or her attention on the locality of the movement of one ball as he or she plays with them, knowing how to move at every instant in relation to all the other balls, shows that the whole matrix of relations and movements of the constellation of balls is accessible to him or her all the time. So, juggling is an isophor of the vision that one must have of the operational-relational matrix in which something occurs to be able to honestly claim that one understands it. That is, juggling is an isophor of the vision that one wants to have to claim that one understands, for example, a biological or a cultural happening (such as effective system practice)<sup>3</sup>

The first ball, Being, is concerned with our own awareness and our ethics of action, thus the responsibility we take as citizens. Though it may manifest differently in various situations, Being is primarily a consequence of the background, experiences and prejudices, or pre-understandings, of being the practitioner. So, to consider the B-ball it is necessary to 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 will be explored.

The second ball is the E-ball – engaging with a 'real world' situation. How a practitioner engages with a situation is not just a property of the situation. The practitioner can choose how to orient and look, and has choices in how to engage. Thus the 'real world' could be experienced as simple or complicated, as a situation

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<sup>1</sup>Students of the Open University course/Managing Systemic Change. Inquiry, Action and Interaction (TU812) have offered other possible isophors such as knitting, guitar playing.

<sup>2</sup>It was Kathleen Forsythe's paper on Cathedrals of the Mind (1986, p. 175) that led Maturana to invent the term isophor (Bunnell, May 2009, Personal communication. Systems Ecologist, President of Lifeworks, Vancouver, BC, Canada). Understood as either a metaphor or isophor can reveal different insights. In this second edition my preference is isophor over metaphor because of my focus on relational dynamics as central to systems practice.

<sup>3</sup>Humberto Maturana (personal communication, 19 August 2009).

or as a system. I will argue that the failure to be aware of the choices we have in juggling the E-ball has given rise, all too often, to policy failure (APSC 2007) or some other unintended consequence.

The third ball, the C-ball, is concerned with how a systems practitioner puts particular systems approaches into Context for taking action in ‘real world’ situations. 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 Contextualisation involved in the choice of approach in relation to situation. Courses that teach about systems approaches are often designed to focus primarily on the C-ball; however, they usually teach how to match an existing systems approach with an area of application.<sup>4</sup>

The final ball the effective practitioner juggles is that of Managing (M). The M-ball is concerned with juggling as an overall performance; managing both the juggling and the desired change in the world. Another way to describe this is as co-managing self and situation. As the term managing is often used to describe the process by which a practitioner engages with a ‘real-world’ situation it can be considered as a special form of engagement, so later I will explore some of the features associated with what I include in the notion of managing. For example, managing also introduces the idea of change over time, in the situation, the approach and the practitioner – of adapting oneself and one’s performance.

I invite you to interpret the juggler isophor in terms of:

- Your relationship with yourself as a practitioner or your sensibilities of being a practitioner
- The choices you are envisaging about a situation as you and other stakeholders perceive it (i.e. your mode of engaging with a situation of interest)
- Your manner of adapting your practice to the circumstances (contextualising)
- How you plan to perform your practice through the act of managing the overall activity.

Having introduced all of the key elements of the juggler isophor I will now provide some general background as to why I consider these four balls to be important. I will also introduce a Reading to exemplify how a particular systems practitioner engages in their ‘juggling’ and draw out some practical implications.

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<sup>4</sup>For too long in my view the Systems field has been plagued by method and methodology wars – incessant arguing about the virtues, or otherwise, of particular methods and methodologies, often in the form of a product offered by a consulting group. Unfortunately, this has constrained both the institutionalisation of Systems within academic life as well as drawing attention away from the praxis of systems as described here. As I do not want to perpetuate this unhelpful situation I want to make it clear that in juggling the C-ball it is not just about choice of a method or application of a method but, rather, the question of how a method or methodology can mediate the emergence of situation-improving action. ‘Putting into context’ could also be understood as a form of bringing forth (as per Maturana – see Proulx 2008) or as a form of context sensitive design (Ison et al. 2007).

In Parts II and III of the book, I will give examples of my own systems practice, that is, my own juggling.

Juggling, as practice, results from a set of relationships. A juggler is a person or living system in a particular context, with body positioned so as to give support from the floor, and in my use of the isophor, four different balls. If any of these things is taken away, the juggler, the connection to the floor or all the balls then juggling will not arise as a practice (as with my example of walking). In some situations an audience might also be important, especially if juggling for money or another form of performance. If I chose to see this situation as if it were a 'system for making money through a juggling performance' then taking away the audience would destroy the 'system of interest', the interconnected set of relationships that was envisioned. But there's more to this set of relationships than meets the eye. Take the juggler for example, s/he's both a unique person and also part of a lineage of organisms or 'living systems'. All 'living systems' have an evolutionary past, which means biologically we humans are essentially the same, but an individual developmental past that is unique to each individual. For humans this means we each have a unique set of experiences so that one person's world is always different from another person's world. We humans never truly 'share' common experiences because this is biologically impossible. We can however communicate with each other about our experiences.

Before I introduce Reading 3, which exemplifies a form of systems practice, and which can be used to tease out aspects of 'juggling' I want to expand on why I claim juggling is an isophor and how an isophor differs from a metaphor. As I explained earlier the essence of how metaphor works is to express one thing in terms of something else, such as in the phrase 'the office is a warzone'. This metaphor invites us to think of the office as if it were a warzone; in operational terms it provides a sort of gestalt which is often the basis of innovation, i.e. it takes one to a new place. At no stage do we consider the office to be an actual warzone. Following this logic of how metaphors work my use of 'systems practice as juggler' if it were to be regarded as a metaphor would take you from 'systems practice' as one thing to juggling as something else. But this dynamic is an *abstraction* divorced from our doing, our actions – thinking, feeling, experiencing – which led *Humberto Maturana* with Kathleen Forsythe to coin the term isophor to explain the dynamic of experiencing the same thing through another means – in this case experiencing systems practice by the doing of juggling. To put it rather simplistically by doing some juggling you begin to feel what it would be like to be doing systems practice. On the other hand the balls themselves could still be regarded as metaphors.<sup>5</sup>

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<sup>5</sup>In a revealing paper Leung et al (2011) have found that 'in five studies, findings revealed that both physically and psychologically embodying creative metaphors promote fluency, flexibility, and/or originality in problem-solving. Going beyond prior research that focused primarily on the kind of embodiment that primes preexisting knowledge, we provide the first evidence that embodiment can also activate cognitive processes conducive for generating previously unknown ideas and connections'.

## 4.2 An Example of Systems Practice as Juggling

Having introduced the ‘juggler’ as a means to appreciate systems practice as well as the idea that there are choices to make about situations as part of a relational dynamic (as discussed in Chapter 3 and depicted in Fig. 3.5) I would now like to introduce a reading (Reading 3) which exemplifies some further aspects of systems practice in comparison to earlier readings. You will gain much from this reading in its own right but as I am using readings for a particular purpose I would like to invite you to do a little extra work as you read. To reiterate, my purpose is to create the circumstances where you can better appreciate what systems practitioners do when they do what they do. I also want you to make connections with your own life and to begin the process of adding variety to your own systems practice.

My invitation is that as you engage with this reading (Meadows, 1997), please take a particular approach by attending to the following questions:

1. What is the situation and its nature?
2. Who are the main ‘actors’ in the situation?
3. What is at issue?
4. What different ways of understanding and/or engaging with the situation are described by the author?
5. What does the article reveal about the author?
6. Given your current understanding of the idea of juggling in relation to systems practice what can you say about Donella Meadows’ juggling?
7. Faced with the same or a similar situation would you think about it similarly or differently?
8. What does this article reveal about your own ways of thinking and acting?

There is much to be gained from this reading other than answers to my questions. But through your attempt to answer them you will gain the experience of an inquiry process based on the isophor of the juggler. This inquiry process could also, of course, be applied to the earlier readings as well as to readings in later chapters.

### Reading 3

#### Places to Intervene in a System

**Donella H. Meadows**

Folks who do systems analysis have a great belief in ‘leverage points’. These are places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can produce big changes in everything. The systems community has a lot of lore about leverage points. Those of us who were trained by the great Jay Forrester at MIT have absorbed one of his favorite stories. ‘People know intuitively where leverage points are. Time after time I’ve done an analysis of a company and I’ve figured out a leverage point. Then I’ve gone to the company and discovered that everyone is pushing it in the wrong direction!’

(continued)

**Reading 3 (continued)**

The classic example of that backward intuition was Forrester's first world model.

Asked by the Club of Rome to show how major global problems poverty and hunger, environmental destruction, resource depletion, urban deterioration, unemployment, are related and how they might be solved, Forrester came out with a clear leverage point:

Growth. Both population and economic growth. Growth has costs among which are poverty and hunger, environmental destruction the whole list of problems we are trying to solve with growth!

The world's leaders are correctly fixated on economic growth as the answer to virtually all problems, but they're pushing with all their might in the wrong direction.

Counterintuitive. That's Forrester's word to describe complex systems. The systems analysts I know have come up with no quick or easy formulas for finding leverage points. Our counter intuitions aren't that well developed. Give us a few months or years and we'll model the system and figure it out. We know from bitter experience that when we do discover the system's leverage points, hardly anybody will believe us.

Very frustrating. So one day I was sitting in a meeting about the new global trade regime, NAFTA and GATT and the World Trade Organization. The more I listened, the more I began to simmer inside. 'This is a HUGE NEW SYSTEM people are inventing!' I said to myself. 'They haven't the slightest idea how it will behave', myself said back to me. 'It's cranking the system in the wrong direction: growth, growth at any price!! And the control measures these nice folks are talking about, small parameter adjustments, negative feedback loops, are PUNY!'

Suddenly, without quite knowing what was happening, I got up, marched to the flip chart, tossed over a clean page, and wrote: 'Places to Intervene in a System', followed by nine items:

- 9. Numbers (subsidies, taxes, standards)**
- 8. Material stocks and flows**
- 7. Regulating negative feedback loops**
- 6. Driving positive feedback loops**
- 5. Information flows**
- 4. The rules of the system (incentives, punishment, constraints)**
- 3. The power of self-organization**
- 2. The goals of the system**
- 1. The mindset or paradigm out of which the goals, rules, feedback structure arise**

Everyone in the meeting blinked in surprise, including me. 'That's brilliant!' someone breathed. 'Huh?' said someone else. I realized that I had a lot of explaining to do.

(continued)

**Reading 3** (continued)

In a minute I'll go through the list, translate the jargon, give examples and exceptions. First I want to place the list in a context of humility. What bubbled up in me that day was distilled from decades of rigorous analysis of many different kinds of systems done by many smart people. But complex systems are, well, complex. It's dangerous to generalize about them. What you are about to read is not a recipe for finding leverage points. Rather it's an invitation to think more broadly about system change. That's why leverage points are not intuitive.

**9. Numbers**

Numbers ('parameters' in systems jargon) determine how much of a discrepancy turns which faucet how fast. Maybe the faucet turns hard, so it takes a while to get the water flowing. Maybe the drain is blocked and can allow only a small flow, no matter how open it is. Maybe the faucet can deliver with the force of a fire hose. These considerations are a matter of numbers, some of which are physically locked in, but most of which are popular intervention points.

Consider the national debt. It's a negative bathtub, a money hole. The rate at which it sinks is the annual deficit. Tax income makes it rise, government expenditures make it fall. Congress and the president argue endlessly about the many parameters that open and close tax faucets and spending drains. Since those faucets and drains are connected to the voters, these are politically charged parameters. But, despite all the fireworks, and no matter which party is in charge, the money hole goes on sinking, just at different rates.

The amount of land we set aside for conservation. The minimum wage. How much we spend on AIDS research or Stealth bombers. The service charge the bank extracts from your account. All these are numbers, adjustments to faucets. So, by the way, is firing people and getting new ones. Putting different hands on the faucets may change the rate at which they turn, but if they're the same old faucets, plumbed into the same system, turned according to the same information and rules and goals, the system isn't going to change much. Bill Clinton is different from George Bush, but not all that different.

Numbers are last on my list of leverage points. Diddling with details, arranging the deck chairs on the Titanic. Probably 95% of our attention goes to numbers, but there's not a lot of power in them. Not that parameters aren't important, they can be, especially in the short term and to the individual who's standing directly in the flow. But they RARELY CHANGE BEHAVIOR. If the system is chronically stagnant, parameter changes rarely kick-start it. If it's wildly variable, they don't usually stabilize it. If it's growing out of control, they don't break it.

Whatever cap we put on campaign contributions, it doesn't clean up politics. The Feds fiddling with the interest rate haven't made business cycles go away. (We always forget that during upturns, and are shocked, shocked by the downturns.) Spending more on police doesn't make crime go away.

(continued)

**Reading 3** (continued)

However, there are critical exceptions. Numbers become leverage points when they go into ranges that kick off one of the items higher on this list. Interest rates or birth rates control the gains around positive feedback loops. System goals are parameters that can make big differences. Sometimes a system gets onto a chaotic edge, where the tiniest change in a number can drive it from order to what appears to be wild disorder.

Probably the most common kind of critical number is the length of delay in a feedback loop. Remember that bathtub on the fourth floor I mentioned, with the water heater in the basement? I actually experienced one of those once, in an old hotel in London. It wasn't even a bathtub with buffering capacity; it was a shower. The water temperature took at least a minute to respond to my faucet twists. Guess what my shower was like. Right, oscillations from hot to cold and back to hot, punctuated with expletives. Delays in negative feedback loops cause oscillations. If you're trying to adjust a system state to your goal, but you only receive delayed information about what the system state is, you will overshoot and undershoot.

Same if your information is timely, but your response isn't. For example, it takes several years to build an electric power plant, and then that plant lasts, say, 30 years. Those delays make it impossible to build exactly the right number of plants to supply a rapidly changing demand. Even with immense effort at forecasting, almost every electricity industry in the world experiences long oscillations between overcapacity and undercapacity. A system just can't respond to short-term changes when it has long-term delays. That's why a massive central-planning system, such as the Soviet Union or General Motors, necessarily functions poorly.

A delay in a feedback process is critical **RELATIVE TO RATES OF CHANGE (growth, fluctuation, decay) IN THE SYSTEM STATE THAT THE FEEDBACK LOOP IS TRYING TO CONTROL**. Delays that are too short cause overreaction, oscillations amplified by the jumpiness of the response. Delays that are too long cause damped, sustained, or exploding oscillations, depending on how much too long. At the extreme they cause chaos. Delays in a system with a threshold, a danger point, and a range past which irreversible damage can occur, cause overshoot and collapse.

Delay length would be a high leverage point, except for the fact that delays are not often easily changeable. Things take as long as they take. You can't do a lot about the construction time of a major piece of capital, or the maturation time of a child, or the growth rate of a forest. It's usually easier to slow down the change rate (positive feedback loops, higher on this list), so feedback delays won't cause so much trouble. Critical numbers are not nearly as common as people seem to think they are. Most systems have evolved or are designed to stay out of sensitive parameter ranges. Mostly, the numbers are not worth the sweat put into them.

(continued)

**Reading 3** (continued)**8. Material Stocks and Flows**

The plumbing structure, the stocks and flows and their physical arrangement, can have an enormous effect on how a system operates. When the Hungarian road system was laid out so all traffic from one side of the nation to the other had to pass through central Budapest, that determined a lot about air pollution and commuting delays that are not easily fixed by pollution control devices, traffic lights, or speed limits. The only way to fix a system that is laid out wrong is to rebuild it, if you can. Often you can't, because physical building is a slow and expensive kind of change. Some stock-and-flow structures are just plain unchangeable.

The baby-boom swell in the US population first caused pressure on the elementary school system, then high schools and colleges, then jobs and housing, and now we're looking forward to supporting its retirement. Not much to do about it, because 5-year-olds become 6-year-olds, and 64-year-olds become 65-year-olds predictably and unstoppable. The same can be said for the lifetime of destructive CFC molecules in the ozone layer, for the rate at which contaminants get washed out of aquifers, for the fact that an inefficient car fleet takes ten to twenty years to turn over.

The possible exceptional leverage point here is in the size of stocks, or buffers. Consider a huge bathtub with slow in and outflows. Now think about a small one with fast flows. That's the difference between a lake and a river. You hear about catastrophic river floods much more often than catastrophic lake floods, because stocks that are big, relative to their flows, are more stable than small ones. A big, stabilizing stock is a buffer.

The stabilizing power of buffers is why you keep money in the bank rather than living from the flow of change through your pocket. It's why stores hold inventory instead of calling for new stock just as customers carry the old stock out the door. It's why we need to maintain more than the minimum breeding population of an endangered species. Soils in the eastern US are more sensitive to acid rain than soils in the west, because they haven't got big buffers of calcium to neutralize acid. You can often stabilize a system by increasing the capacity of a buffer. But if a buffer is too big, the system gets inflexible. It reacts too slowly. Businesses invented just-in-time inventories, because occasional vulnerability to fluctuations or screw-ups is cheaper than certain, constant inventory costs, and because small-to-vanishing inventories allow more flexible response to shifting demand.

There's leverage, sometimes magical, in changing the size of buffers. But buffers are usually physical entities, not easy to change. The acid absorption capacity of eastern soils is not a leverage point for alleviating acid rain damage. The storage capacity of a dam is literally cast in concrete. Physical structure is crucial in a system, but the leverage point is in proper design in the first place. After the structure is built, the leverage is in understanding its limitations and bottlenecks and refraining from fluctuations or expansions that strain its capacity.

(continued)

**Reading 3 (continued)****7. Regulating Negative Feedback Loops**

Now we're beginning to move from the physical part of the system to the information and control parts, where more leverage can be found. Nature evolves negative feedback loops and humans invent them to keep system states within safe bounds. A thermostat loop is the classic example. Its purpose is to keep the system state called 'room temperature' fairly constant at a desired level. Any negative feedback loop needs a goal (the thermostat setting), a monitoring and signaling device to detect excursions from the goal (the thermostat), and a response mechanism (the furnace and/or air conditioner, fans, heat pipes, fuel, etc.).<sup>6</sup>

A complex system usually has numerous negative feedback loops it can bring into play, so it can self-correct under different conditions and impacts. Some of those loops may be inactive much of the time, like the emergency cooling system in a nuclear power plant, or your ability to sweat or shiver to maintain your body temperature. One of the big mistakes we make is to strip away these emergency response mechanisms because they aren't often used and they appear to be costly. In the short term we see no effect from doing this. In the long term, we narrow the range of conditions over which the system can survive.

One of the most heartbreaking ways we do this is in encroaching on the habitats of endangered species. Another is in encroaching on our own time for rest, recreation, socialization and meditation.

The 'strength' of a negative loop, its ability to keep its appointed stock at or near its goal, depends on the combination of all its parameters and links, the accuracy a rapidity of monitoring, the quickness and power of response, the directness and size of corrective flows.

There can be leverage points here. Take markets, for example, the negative feedback systems that are all but worshipped by economists, and they can indeed be marvels of self-correction, as prices vary to keep supply and demand in balance. The more the price, the central signal to both producers and consumers, is kept clear, unambiguous, timely, and truthful, the more smoothly markets will operate. Prices that reflect full costs will tell consumers how much they can actually afford and will reward efficient producers. Companies and governments are fatally attracted to the price leverage point, of course, all of them pushing in the wrong direction with subsidies, fixes, externalities, taxes, and other forms of confusion. The REAL leverage here is to keep them from doing it. Hence anti-trust laws, truth-in-advertising laws, attempts to internalize costs (such as pollution taxes), the removal of perverse subsidies, and other ways of leveling market playing fields.

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<sup>6</sup>This claim may warrant critical scrutiny – a common fallacy here is the idea that a goal is needed, i.e. the signalling device that responds to above or below is all that matters. However, we interpret the 'goal' based on the result. We create a goal with our thermostat setting, but the 'thermostat system' itself has no 'goal'. In other words, the goal is only a heuristic invention, not part of the system (unless the observer/designer with a goal in mind is included), but about our relation to the mechanism, it represents our value.

**Reading 3** (continued)

The strength of a negative feedback loop is important **RELATIVE TO THE IMPACT IT IS DESIGNED TO CORRECT**. If the impact increases in strength, the feedbacks have to be strengthened too.

A thermostat system may work fine on a cold winter day, but open all the windows and its corrective power will fail. Democracy worked better before the advent of the brainwashing power of centralized mass communications. Traditional controls on fishing were sufficient until radar spotting and drift nets and other technologies made it possible for a few actors to wipe out the fish. The power of big industry calls for the power of big government to hold it in check; a global economy makes necessary a global government.

Here are some other examples of strengthening negative feedback controls to improve a system's self-correcting abilities: preventive medicine, exercise, and good nutrition to bolster the body's ability to fight disease, integrated pest management to encourage natural predators of crop pests, the Freedom of Information Act to reduce government secrecy, protection for whistle blowers, impact fees, pollution taxes and performance bonds to recapture the externalized public costs of private benefits.

**6. Driving Positive Feedback Loops**

A positive feedback loop is self-reinforcing. The more it works, the more it has power to work some more.

The more people catch the flu, the more they infect other people. The more babies are born, the more people grow up to have babies. The more money you have in the bank, the more interest you earn, the more money you have in the bank. The more the soil erodes, the less vegetation it can support, the fewer roots and leaves to soften rain and runoff, the more soil erodes. The more high-energy neutrons in the critical mass, the more they knock into nuclei and generate more.

Positive feedback loops drive growth, explosion, erosion, and collapse in systems. A system with an unchecked positive loop ultimately will destroy itself. That's why there are so few of them.

Usually a negative loop kicks in sooner or later. The epidemic runs out of infectable people, or people take increasingly strong steps to avoid being infected. The death rate rises to equal the birth rate, or people see the consequences of unchecked population growth and have fewer babies. The soil erodes away to bedrock, and after a million years the bedrock crumbles into new soil, or people put up check dams and plant trees.

In those examples, the first outcome is what happens if the positive loop runs its course, the second is what happens if there's an intervention to reduce its power.

Reducing the gain around a positive loop, slowing the growth, is usually a more powerful leverage point in systems than strengthening negative loops, and much preferable to letting the positive loop run.

(continued)

**Reading 3** (continued)

Population and economic growth rates in the world model are leverage points, because slowing them gives the many negative loops, through technology and markets and other forms of adaptation, time to function. It's the same as slowing the car when you're driving too fast, rather than calling for more responsive brakes or technical advances in steering.

The most interesting behavior that rapidly turning positive loops can trigger is chaos. This wild, unpredictable, unreplicable, and yet bounded behavior happens when a system starts changing much, much faster than its negative loops can react to it.

For example, if you keep raising the capital growth rate in the world model, eventually you get to a point where one tiny increase more will shift the economy from exponential growth to oscillation. Another nudge upward gives the oscillation a double beat. And just the tiniest further nudge sends it into chaos.

I don't expect the world economy to turn chaotic any time soon (not for that reason, anyway). That behavior occurs only in unrealistic parameter ranges, equivalent to doubling the size of the economy within a year. Realworld systems do turn chaotic, however, if something in them can grow or decline very fast. Fast-replicating bacteria or insect populations, very infectious epidemics, wild speculative bubbles in money systems, neutron fluxes in the guts of nuclear power plants. These systems are hard to control, and control must involve slowing down the positive feedbacks.

In more ordinary systems, look for leverage points around birth rates, interest rates, erosion rates, 'success to the successful' loops, any place where the more you have of something, the more you have the possibility of having more.

**5. Information Flows**

There was this subdivision of identical houses, the story goes, except that the electric meter in some of the houses was installed in the basement and in others it was installed in the front hall, where the residents could see it constantly, going round faster or slower as they used more or less electricity.

Electricity consumption was 30% lower in the houses where the meter was in the front hall.

Systems-heads love that story because it's an example of a high leverage point in the information structure of the system. It's not a parameter adjustment, not a strengthening or weakening of an existing loop. It's a NEW LOOP, delivering feedback to a place where it wasn't going before.

In 1986 the US government required that every factory releasing hazardous air pollutants report those emissions publicly. Suddenly everyone could find out precisely what was coming out of the smokestacks in town. There was no law against those emissions, no fines, no determination of 'safe' levels, just information. But by 1990 emissions dropped 40%. One chemical company that found itself on the Top Ten Polluters list reduced its emissions by 90%, just to 'get off that list'.

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**Reading 3 (continued)**

Missing feedback is a common cause of system malfunction. Adding or rerouting information can be a powerful intervention, usually easier and cheaper than rebuilding physical structure.

The tragedy of the commons that is exhausting the world's commercial fisheries occurs because there is no feedback from the state of the fish population to the decision to invest in fishing vessels. (Contrary to economic opinion, the price of fish doesn't provide that feedback. As the fish get more scarce and hence more expensive, it becomes all the more profitable to go out and catch them. That's a perverse feedback, a positive loop that leads to collapse.)

It's important that the missing feedback be restored to the right place and in compelling form. It's not enough to inform all the users of an aquifer that the groundwater level is dropping. That could trigger a race to the bottom. It would be more effective to set a water price that rises steeply as the pumping rate exceeds the recharge rate.

Suppose taxpayers got to specify on their return forms what government services their tax payments must be spent on. (Radical democracy!) Suppose any town or company that puts a water intake pipe in a river had to put it immediately DOWNSTREAM from its own outflow pipe. Suppose any public or private official who made the decision to invest in a nuclear power plant got the waste from that plant stored on his/her lawn.

There is a systematic tendency on the part of human beings to avoid accountability for their own decisions. That's why there are so many missing feedback loops, and why this kind of leverage point is so often popular with the masses, unpopular with the powers that be, and effective, if you can get the powers that be to permit it to happen or go around them and make it happen anyway.

**4. The Rules of the System (Incentives, Punishments, Constraints)**

The rules of the system define its scope, boundaries, degrees of freedom. Thou shalt not kill. Everyone has the right of free speech. Contracts are to be honored. The president serves 4-year terms and cannot serve more than two of them. Nine people on a team, you have to touch every base, three strikes and you're out. If you get caught robbing a bank, you go to jail.

Mikhail Gorbachev came to power in the USSR and opened information flows (glasnost) and changed the economic rules (perestroika), and look what happened.

Constitutions are strong social rules. Physical laws such as the second law of thermodynamics are absolute rules, if we understand them correctly. Laws, punishments, incentives, and informal social agreements are progressively weaker rules.

To demonstrate the power of rules, I ask my students to imagine different ones for a college. Suppose the students graded the teachers. Suppose you

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**Reading 3** (continued)

come to college when you want to learn something, and you leave when you've learned it. Suppose professors were hired according to their ability to solve real-world problems, rather than to publish academic papers. Suppose a class got graded as a group, instead of as individuals.

Rules change behavior. Power over rules is real power.

That's why lobbyists congregate when Congress writes laws, and why the Supreme Court, which interprets and delineates the Constitution, the rules for writing the rules, has even more power than Congress.

If you want to understand the deepest malfunctions of systems, pay attention to the rules, and to who has power over them.

That's why my systems intuition was sending off alarm bells as the new world trade system was explained to me. It is a system with rules designed by corporations, run by corporations, for the benefit of corporations. Its rules exclude almost any feedback from other sectors of society. Most of its meetings are closed to the press (no information, no feedback). It forces nations into positive loops, competing with each other to weaken environmental and social safeguards in order to attract corporate investment. It's a recipe for unleashing 'success to the successful' loops.

**3. The Power of Self-Organization**

The most stunning thing living systems can do is to change themselves utterly by creating whole new structures and behaviors. In biological systems that power is called evolution. In human economies it's called technical advance or social revolution. In systems lingo it's called self-organization.

Self-organization means changing any aspect of a system lower on this list, adding or deleting new physical structure, adding or deleting negative or positive loops or information flows or rules. The ability to self-organize is the strongest form of system resilience, the ability to survive change by changing.

The human immune system can develop responses to (some kinds of) insults it has never before encountered. The human brain can take in new information and pop out completely new thoughts.

Self-organization seems so wondrous that we tend to regard it as mysterious, miraculous. Economists often model technology as literal manna from heaven, coming from nowhere, costing nothing, increasing the productivity of an economy by some steady percent each year. For centuries people have regarded the spectacular variety of nature with the same awe. Only a divine creator could bring forth such a creation.

In fact the divine creator does not have to produce miracles. He, she, or it just has to write clever RULES FOR SELF-ORGANIZATION. These rules govern how, where, and what the system can add onto or subtract from itself under what conditions.

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**Reading 3** (continued)

Self-organizing computer models demonstrate that delightful, mindboggling patterns can evolve from simple evolutionary algorithms. (That need not mean that real-world algorithms are simple, only that they can be.) The genetic code that is the basis of all biological evolution contains just four letters, combined into words of three letters each. That code, and the rules for replicating and rearranging it, has spewed out an unimaginable variety of creatures.

Self-organization is basically a matter of evolutionary raw material, a stock of information from which to select possible patterns, and a means for testing them. For biological evolution the raw material is DNA, one source of variety is spontaneous mutation, and the testing mechanism is something like punctuated Darwinian selection. For technology the raw material is the body of understanding science has accumulated. The source of variety is human creativity (whatever THAT is) and the selection mechanism is whatever the market will reward or whatever governments and foundations will fund or whatever tickles the fancy of crazy inventors.

When you understand the power of self-organization, you begin to understand why biologists worship biodiversity even more than economists worship technology. The wildly varied stock of DNA, evolved and accumulated over billions of years, is the source of evolutionary potential, just as science libraries and labs and scientists are the source of technological potential. Allowing species to go extinct is a systems crime, just as randomly eliminating all copies of particular science journals, or particular kinds of scientists, would be.

The same could be said of human cultures, which are the store of behavioral repertoires accumulated over not billions, but hundreds of thousands of years. They are a stock out of which social evolution can arise. Unfortunately, people appreciate the evolutionary potential of cultures even less than they understand the potential of every genetic variation in ground squirrels. I guess that's because one aspect of almost every culture is a belief in the utter superiority of that culture.

Any system, biological, economic, or social, that scorns experimentation and wipes out the raw material of innovation is doomed over the long term on this highly variable planet.

The intervention point here is obvious but unpopular. Encouraging diversity means losing control. Let a thousand flowers bloom and ANYTHING could happen!

Who wants that?

**2. The Goals of the System**

Right there, the push for control is an example of why the goal of a system is even more of a leverage point than the self-organizing ability of a system.

If the goal is to bring more and more of the world under the control of one central planning system (the empire of Genghis Khan, the world of

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**Reading 3** (continued)

Islam, the People's Republic of China, WalMart, Disney), then everything further down the list, even self-organizing behavior, will be pressured or weakened to conform to that goal.<sup>7</sup>

That's why I can't get into arguments about whether genetic engineering is a good or a bad thing. Like all technologies, it depends upon who is wielding it, with what goal. The only thing one can say is that if corporations wield it for the purpose of generating marketable products, that is a very different goal, a different direction for evolution than anything the planet has seen so far.

There is a hierarchy of goals in systems. Most negative feedback loops have their own goals, to keep the bath water at the right level, to keep the room temperature comfortable, to keep inventories stocked at sufficient levels. They are small leverage points. The big leverage points are the goals of entire systems.

People within systems don't often recognize what whole-system goal they are serving. To make profits, most corporations would say, but that's just a rule, a necessary condition to stay in the game. What is the point of the game? To grow, to increase market share, to bring the world (customers, suppliers, regulators) more under the control of the corporation, so that its operations become ever more shielded from uncertainty. That's the goal of a cancer cell too and of every living population. It's only a bad one when it isn't countered by higher-level negative feedback loops with goals of keeping the system in balance. The goal of keeping the market competitive has to trump the goal of each corporation to eliminate its competitors. The goal of keeping populations in balance and evolving has to trump the goal of each population to commandeer all resources into its own metabolism.

I said a while back that changing the players in a system is a low-level intervention, as long as the players fit into the same old system. The exception to that rule is at the top, if a single player can change the system's goal.

I have watched in wonder as, only very occasionally, a new leader in an organization, from Dartmouth College to Nazi Germany, comes in, enunciates a new goal, and single-handedly changes the behavior of hundreds or thousands or millions of perfectly rational people. That's what Ronald Reagan did. Not long before he came to office, a president could say, 'Ask not what government can do for you, ask what you can do for the government', and no one even laughed. Reagan said the goal is not to get the people to help the government and not to get government to help the people, but to get the government off our backs. One can argue, and I would, that

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<sup>7</sup>From a second-order cybernetic perspective it could be claimed that Donella, like most people, was at this point in her thinking not aware that Control and Goal are both human concepts grounded in our ability to imagine and desire a particular configuration, with the goal being a description of the condition of a system under the configuration of being subject to actions named control. It's our belief that we can choose to do or not do the actions that turns them into a 'control'.

**Reading 3** (continued)

larger system changes let him get away with that. But the thoroughness with which behavior in the US and even the world has been changed since Reagan is testimony to the high leverage of articulating, repeating, standing for, insisting upon new system goals.

**1. The Mindset or Paradigm Out of Which the System Arises**

Another of Jay Forrester's systems sayings goes: It doesn't matter how the tax law of a country is written. There is a shared idea in the minds of the society about what a 'fair' distribution of the tax load is. Whatever the rules say, by fair means or foul, by complications, cheating, exemptions or deductions, by constant sniping at the rules, the actual distribution of taxes will push right up against the accepted idea of 'fairness'.

The shared idea in the minds of society, the great unstated assumptions, unstated because unnecessary to state; everyone knows them, constitute that society's deepest set of beliefs about how the world works. There is a difference between nouns and verbs. People who are paid less are worth less. Growth is good. Nature is a stock of resources to be converted to human purposes. Evolution stopped with the emergence of *Homo sapiens*. One can 'own' land. Those are just a few of the paradigmatic assumptions of our culture, all of which utterly dumbfound people of other cultures.

Paradigms are the sources of systems. From them come goals, information flows, feedbacks, stocks, flows.

The ancient Egyptians built pyramids because they believed in an after-life. We build skyscrapers, because we believe that space in downtown cities is enormously valuable. (Except for blighted spaces, often near the skyscrapers, which we believe are worthless.) Whether it was Copernicus and Kepler showing that the earth is not the center of the universe, or Einstein hypothesizing that matter and energy are interchangeable, or Adam Smith postulating that the selfish actions of individual players in markets wonderfully accumulate to the common good.

People who manage to intervene in systems at the level of paradigm hit a leverage point that totally transforms systems.

You could say paradigms are harder to change than anything else about a system, and therefore this item should be lowest on the list, not the highest. But there's nothing physical or expensive or even slow about paradigm change. In a single individual it can happen in a millisecond. All it takes is a click in the mind, a new way of seeing. Of course individuals and societies do resist challenges to their paradigm harder than they resist any other kind of change.

So how do you change paradigms? Thomas Kuhn, who wrote the seminal book about the great paradigm shifts of science, has a lot to say about that. In a nutshell, you keep pointing at the anomalies and failures in the old

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**Reading 3** (continued)

paradigm, you come yourself, loudly, with assurance, from the new one, you insert people with the new paradigm in places of public visibility and power. You don't waste time with reactionaries; rather you work with active change agents and with the vast middle ground of people who are open-minded.

Systems folks would say one way to change a paradigm is to model a system, which takes you outside the system and forces you to see it whole. We say that because our own paradigms have been changed that way.

**0. The Power to Transcend Paradigms**

Sorry, but to be truthful and complete, I have to add this kicker. The highest leverage of all is to keep oneself unattached in the arena of paradigms, to realize that NO paradigm is 'true', that even the one that sweetly shapes one's comfortable worldview is a tremendously limited understanding of an immense and amazing universe.

It is to 'get' at a gut level the paradigm that there are paradigms, and to see that that itself is a paradigm, and to regard that whole realization as devastatingly funny. It is to let go into Not Knowing.



**Illustration 4.1**

People who cling to paradigms (just about all of us) take one look at the spacious possibility that everything we think is guaranteed to be nonsense and pedal rapidly in the opposite direction. Surely there is no power, no control, not even a reason for being, much less acting, in the experience that there is no certainty in any worldview. But everyone who has managed to entertain that idea, for a moment or for a lifetime, has found it a basis for radical empowerment. If no paradigm is right, you can choose one that will help achieve your purpose. If you have no idea where to get a purpose, you

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**Reading 3** (continued)

can listen to the universe (or put in the name of your favorite deity here) and do his, her, its will, which is a lot better informed than your will.

It is in the space of mastery over paradigms that people throw off addictions, live in constant joy, bring down empires, get locked up or burned at the stake or crucified or shot, and have impacts that last for millennia.

Back from the sublime to the ridiculous, from enlightenment to caveats. There is so much that has to be said to qualify this list. It is tentative and its order is slithery. There are exceptions to every item on it. Having the list percolating in my subconscious for years has not transformed me into a Superwoman. I seem to spend my time running up and down the list, trying out leverage points wherever I can find them. The higher the leverage point, the more the system resists changing it – that’s why societies rub out truly enlightened beings.

I don’t think there are cheap tickets to system change. You have to work at it, whether that means rigorously analyzing a system or rigorously casting off paradigms. In the end, it seems that leverage has less to do with pushing levers than it does with disciplined thinking combined with strategically, profoundly, madly letting go.

Source: Meadows (1997).<sup>8</sup>

I like this Reading a lot. Why? Because it reveals the passion, enthusiasm and conviction, as well as the analytical and conceptual rigour, of the author. It also, as with previous readings, provides concepts and examples that I can build into my own systems practice. Importantly though, the paper gives many rich insights into Donella Meadows’ form of systems practice. Let me expand on this point by providing responses (R), from my perspective, to the questions (Q) I posed earlier (of course I do not expect you to have responded in the same way. Nor are there right or wrong answers):

Q. What is the situation and its nature?

R. In a first-order sense the situation is the (then) new global trade regime, NAFTA and GATT and the World Trade Organisation – some would claim this was ‘the problem’ but it is clear from Donella’s own behaviour that the nature of the situation was (and still is) contested. ‘This is a HUGE NEW SYSTEM people are inventing!’ she said to herself. Possibly she assumed the situation to be a complex system much as she does for ‘a corporation, an economy, a living body, a city, an ecosystem’. More specifically however the

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<sup>8</sup>In a later publication the number of places to intervene was increased from 10 to 12. See Meadows, D. (1999). *Leverage points: Places to intervene in a system*. Hartland: The Sustainability Institute.

situation was Donella's participation in a meeting where this important, but complex matter was being discussed and where the conceptualisations and explanations were at odds with her own: 'I said to myself. "They haven't the slightest idea how it will behave," myself said back to me. "It's cranking the system in the wrong direction: growth, growth at any price!! And the control measures these nice folks are talking about, small parameter adjustments, negative feedback loops, are PUNY!"' It was her experiences in this meeting that triggered the actions and reflections which she writes about in the paper.

Q. Who are the main 'actors' in the situation?

R. These are not made clear; we do not know how Donella came to be in the meeting or who else was present. She does suggest a main set of actors when she says: 'It [NAFTA, GATT] is a system with rules designed by corporations, run by corporations, for the benefit of corporations. Its rules exclude almost any feedback from other sectors of society'. Clearly governments, policy makers, etc. are involved. These are the actors that come to attention if I focus on the situation as something independent of Donella. If I take on board the dynamic depicted in Fig. 3.5 other actors become apparent such as (1) Jay Forrester, of MIT, the 'founding father' of 'systems dynamics' (Ramage and Shipp 2009), (2) the 'systems community' and 'systems folks' who do (3) systems analysis – thus systems analysts.

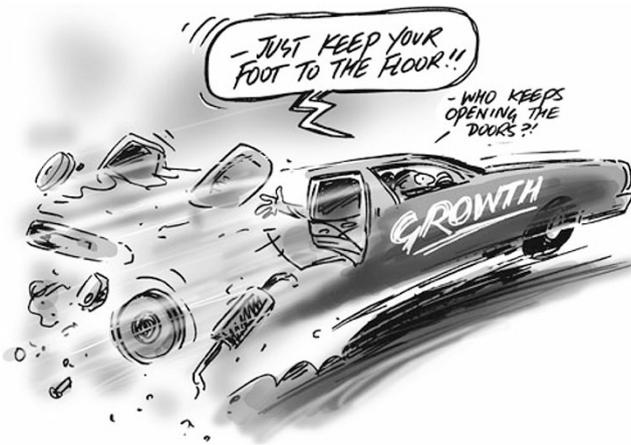


Illustration 4.2

Q. What is at issue?

R. A simplistic response would be to say the design of free trade agreements and other institutional arrangements to foster globalisation and international trade. This is certainly at issue but it is more than this as when Donella says: 'my systems intuition was sending off alarm bells as the new world trade system was explained to me. It is a system with rules designed by corporations, run by corporations, for the benefit of corporations. Its rules exclude almost

any feedback from other sectors of society. Most of its meetings are closed to the press (no information, no feedback). It forces nations into positive loops, competing with each other to weaken environmental and social safeguards in order to attract corporate investment. It's a recipe for unleashing "success to the successful" loops'. To me this account amounts to a common, but often unacknowledged, phenomenon – a contestation over what constitutes a valid explanation and/or design for something. It seems to me highly possible that for Donella the underlying assumptions, concepts and explanations that were dominating the discussion in the room were, in her experience, totally inadequate.

- Q. What different ways of understanding and/or engaging with the situation are described by the author?
- R. In many ways this question gets to the crux of the article. The emotion needed to jump up and explicate her intervention strategies reveal that she was emotionally connected to, or engaged with, the situation (which, as I will explain later, I view as inescapable but desirable when acknowledged and reflected upon, though in academic circles emotion is often sublimated or censored). As I outlined above she chooses the concept of 'system' or 'complex system' as a means to engage with the situation intellectually, hence the title of her article 'places to intervene in a system'; I counted 96 uses of the word 'system', one use of 'systematic', none of 'systemic'. Occasionally the 'problem' metaphor is apparent (four mentions). If I use the ten strategies to intervene, that she outlines, to analyse her own intervention in the meeting (understood by me as a complex, possibly conflictual, situation), then my sense is that she was intervening at levels 0 to 2 and possibly 4 (rules). What success, if any, her intervention had in this meeting is unstated but we know pretty much that the thinking behind international trade and globalisation politics and policy has remained the mainstream view and still persists despite the global financial collapse and, for me, the validity of her arguments. Yet her example in the publication has altered the views of many readers.

In this article Donella uses and exemplifies many key systems concepts some of which are also described in Table 2.1. She thus connects with the theoretical and historical background of Systems in doing what she does and makes explicit linkages to the systems dynamics lineage depicted in Fig. 2.3 through the work of Jay Forrester.

- Q. What does the article reveal about the author?
- R. The article has been written around a key experience of the author's: jumping up in a room full of people and using a flip chart to explicate how her understanding of the situation differs from the 'mainstream conversation'. This particular action is an excellent example of juggling the B-Ball – the author's own being (I will say more about this when I discuss the B-Ball in the next chapter). Importantly for me, she acknowledges her experience within the article – it could have been written as a rather dry and theoretical paper which was based on '10 ways to intervene in a system' but it wasn't. This article as well as the

action of outlining the intervention points in front of what might have been a hostile audience is testimony to how well the author knew her material – how capable and immersed she was within the systems practice lineage of Systems Dynamics. Her examples also demonstrate how her systems dynamics training and understandings enable her to see or recognise issues, concerns, opportunities of a systemic nature in many situations.

Q. Given my current understanding of the idea of juggling in relation to systems practice what can I say about Donella Meadow's juggling?

R. Well it sounds like it was quite a performance! As I outlined above there is good evidence of her juggling the B-ball – her own being. Whether she chose the best way to Engage with the situation is unclear – but it does seem that her audience were prepared to listen and make sense of what she said. So she was certainly using the E-ball, not least through the ten different ways of engaging with a situation (a phrasing I prefer to 'intervening in a system'). As is common in the systems dynamics lineage she chose to see the situation as 'a system' (i.e. as depicted in Fig. 3.4). This is a choice that we can make but as I have outlined it has implications. Her 'performance' as much as we can tell seems to have been appropriately contextualised (the C-Ball) – her systems understandings were powerfully brought into play to illuminate a complex situation. No doubt it was dramatic – but whether effective in the longer term is an open question which probably has little to do with the adequacy of the ideas or explanations for the situation. It is also a matter of contextualising where to look. There is perhaps least evidence of how Donella juggled the M-ball in the initial situation – but her paper is testimony to effective 'managing' of the process of creating a readable and engaging narrative.

At this stage the juggler is my isophor, not yours, and you may experience my answer as a 'forced-fit'; in some ways it is. As I write I imagine a conversation with Donella in which she might argue that her ten interventions are the balls that she juggles in her practice. Alternatively she may have rejected the isophor as inadequate. In asking you to engage with these questions and to use the isophor as an inquiry device my main aim is to help you stand back from the detail of this reading (usually 'content' or 'results' are the main focus) and appreciate it as a practice dynamic, a form of performance.

Q. Faced with the same or a similar situation would I think about it similarly or differently?

R. I think the end result of my own thinking about the situation (i.e. globalisation) would be very similar to Donella's. I would use or draw upon many of the same systems concepts (e.g. self-organisation) but perhaps deploy them differently as well as using other systems concepts. My own experience of the systems dynamics lineage is not nearly as strong as Donella's and so I would not be able to use the thinking in the way that she did in the meeting – though in similar circumstances I could draw on my own understandings to make similar points. I will certainly add these ten points or variations of them to my own systems practice repertoire. As I outline in my response to the next question

I would choose to use some of the concepts and language differently for both practical and theoretical reasons.

Q. What does this article reveal about my own ways of thinking and acting?

R. In my response I am going to focus on the insights I have gained from this article about my own systems thinking and explore some of the differences and similarities with the author. In doing so I want to make it clear that I am not criticising or being critical of this article although what I write could be seen as a critique. My differences in thinking relate to:

- The way in which ‘system’ is conflated with ‘situation’ (what I mean can be understood by looking at Fig. 3.4) and, as a consequence
- The absence of attention to who brings forth a system by what means – in systems theoretical terms this is the issue of who participates in making boundary judgements about what is in or outside a system of interest
- The focus on goals rather than desired outcomes or questions of purpose
- Some of the implications of certain metaphors e.g. ‘leverage points’, ‘systems analysis’, ‘analysing a system’, ‘intervening in a system’
- Anxieties as to how misunderstandings could arise about the nature of ‘information’ and her use of, and role for, ‘rules’.

This is not such a long list so we have much in common. If I had to highlight some of the things I particularly like in this paper at the top of my list would be:

- The need for awareness that transcends paradigms – ‘It is to ‘get’ at a gut level the paradigm that there are paradigms, and to see that that itself is a paradigm, and to regard that whole realisation as devastatingly funny. It is to let go into Not Knowing’ or the recognition that ‘there is no certainty in any worldview’ and that systems practice is concerned with ‘disciplined thinking combined with strategically, profoundly, madly letting go’
- Excellent accounts of the nature and importance of positive and negative feedback processes (see also Table 2.1)
- Sound arguments for paying much more attention to creating the circumstances for self-organisation.

The 10 intervention points are also a useful device to think about where my own focus has been in developing and using my systems practice. My assessment is that it has been at levels 0 to 5, though not exclusively – something you will no doubt find reflected in this book.

In relation to my own ways of acting I find I relate readily to the sense of frustration that led Donella to jump up in the meeting, triggered I suggest by her experience of the failure by others to engage systemically with complex situations. My experience is that it is necessary to act in this way from time to time to maintain one’s equilibrium but that in the main it is not the most useful form of practice. Instead, I am now guided by the following question: How is it that I could create the circumstances whereby others could engage with this situation systemically? In Part III, I will discuss this under the rubric of the ‘design of learning systems’.

### 4.3 Reflecting on Reflections

Effective systems practice incorporates reflective practice, including an awareness of how questions are framed and answered. With this in mind I would like to draw your attention to some aspects of the questions I posed in Section 4.2. Considered in isolation some could be seen to be about the situation Meadows found herself in (1, 2, 3). The next set of questions (4, 5) were more to do with Donella and her mode of engagement with the situation. So questions 1–5 illuminate the dynamic depicted in Fig. 3.5 but they do so through the question-responder’s history, or traditions of understanding and this is different to yours and Donella’s (to which we have no direct access). Finally questions 6–8 were more focused on you and your understandings, from a position outside, or meta as depicted in Fig. 3.5. Your answers to questions 1–5 rely heavily on your interpretive skills and thus, on the tradition of understanding from which you interpret. Historically and as part of daily life there is a tendency to focus only on questions and concerns associated with ‘the situation’, i.e. questions of the 1–3 type. Important as these are they are only part of the systemic dynamic that underlies systems practice that is captured by the juggler isophor. The practitioner with a chosen framework of ideas (F in Fig. 3.5) is well illustrated in the Reading by the commitment of the author to the systems dynamics lineage of seeing systems in the world (in the sense shown in Fig. 3.4) – so this is part of her engaging with the situation (Meadows 2008). Becoming aware of these distinctions and levels is part of improving your own system practice.

Having provided a set of answers to the questions I posed for Reading 3, I want to draw attention back to my primary purpose in offering readings. That is to provide you with vicarious experiences that give insights into what is entailed in doing systems practice – your own systems practice – through the lens of the question: what is it that we do when we do what we do? To do this I want to briefly return to discussing systems practice as an ‘ideal type’, as introduced in Chapter 3. In the next four chapters (Chapters 5–8), I will further unpack the ‘juggler isophor’.

So what constitutes an Ideal Systems Practitioner? First, this person is able to draw on their experience of different systems traditions to enact a systems approach, or approaches, in managing ‘real world’ situations. Understandably I will not be overly concerned here with approaches to practise other than systems approaches and will not be making any extravagant claims that any given systems approach is better than any other forms of practice (but I will return to the issue of effectiveness in Part IV). I will, however, develop arguments that support four claims. These are:

- systems practice has particular characteristics that make it qualitatively different to other forms of practice
- An effective and aware systems practitioner can call on a greater variety of options for doing something about complex ‘real-world’ situations than other practitioners do

- Being able to deploy more choices when acting so as to enhance systemically desirable and culturally feasible change has important ethical dimensions
- Our individual and collective capabilities to think and act systemically are under-developed and this situation is a strategic vulnerability for us, as a species, at a time when concerns are growing for our continued existence in a co-evolutionary, climate-change world.

These are important claims. They will structure most of the argument made in the rest of Part II through the vehicle of the juggler isophor. I am not the only one to approach practice from this perspective or to draw on Meadows' work as inspiration as for example, in 'Navigating the Eternally Unfolding Present: Toward an Epistemology of Practice' (Cook and Wagenaar 2012) and 'Leverage points for sustainability transformation' (Abson et al. 2017). Cook and Wagenaar (2012) make the point, important to my arguments here, that the model of practice as applied knowledge has many shortcomings, yet it is the mainstream view. Instead, they argue, as do I, that 'knowledge and context can be explained in terms of – and are evoked within – practice, and not the other way round – and that this transpires within real worlds each of which has its own unique constraints and affordances, histories and futures' (p. 13). So just as a juggler performance that is effective emerges through the embodied, enacted, operational dynamics of the situated practitioner, so too do context and knowing emerge concurrently in a form of co-evolutionary drift.

The paper by Abson et al. (2017) draws on Donella Meadows' 'places to intervene in a system' to build a typology of actions that the authors see as central to 'sustainability transformations'. This paper is of interest to me in terms of what it reveals and conceals when explored through the question: what do we do when we do what we do? Like you, these authors have engaged with Meadows' work though not through the lens of this particular question. If you have time and interest please explore *what they did when they did what they did*. Put another way this question can be used as a device to reflect on reflections and to conduct a systemic inquiry into practice.

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