

Donella H. Meadows
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[...] People who are raised in the industrial world and who get enthused about systems thinking are likely to make a terrible mistake. They are likely to assume that here, in systems analysis, in interconnection and complication, in the power of the computer, here at last, is the key to prediction and control. This mistake is likely because the mindset of the industrial world assumes that there is a key to prediction and control. [...]

But self-organizing, non-linear, feedback systems are inherently unpredictable. They are not controllable. They are understandable only in the most general way. The goal of foreseeing the future exactly and preparing for it perfectly is unrealizable. The idea of making a complex system do just what you want it to do can be achieved only temporarily, at best. We can never fully understand our world, not in the way our reductionistic science has led us to expect. Our science itself, from quantum theory to the mathematics of chaos, leads us into irreducible uncertainty. For any objective other than the most trivial, we can't optimize; we don't even know what to optimize. We can't keep track of everything. We can't find a proper, sustainable relationship to nature, each other, or the institutions we create, if we try to do it from the role of omniscient conqueror. [...]

Systems thinking leads to another conclusion, however – waiting, shining, obvious, as soon as we stop being blinded by the illusion of control. It says that there is plenty to do, of a different sort of 'doing'. The future can't be predicted, but it can be envisioned and brought lovingly into being.

Systems can't be controlled, but they can be designed and redesigned. We can't surge forward with certainty into a world of no surprises, but we can expect surprises and learn from them and even profit from them. We can't impose our will upon a system. We can listen to what the system tells us, and discover how its properties and our values can work together to bring forth something much better than could ever be produced by our will alone.

We can't control systems or figure them out. But we can dance with them!

I already knew that, in a way before I began to study systems. I had learned about dancing with great powers from whitewater kayaking, from gardening, from playing music, from skiing. All those endeavours require one to stay wide-awake, pay close attention, participate flat-out and respond to feedback. It had never occurred to me that those same requirements might apply to intellectual work, to management, to government, to getting along with people.

But there it was, the message emerging from every computer model we made.

Living successfully in a world of systems requires more of us than our ability to calculate. It requires our full humanity – our rationality, our ability to sort out truth from falsehood, our intuition, our compassion, our vision and our morality. [...]

1. Get the beat

Before you disturb the system in any way, watch how it behaves. If it's a piece of music or a whitewater rapid or a fluctuation in a commodity price, study its beat. If it's a social system, watch it work. Learn its history. Ask people who've been around a long time to tell you what has happened. [...]

Starting with the behaviour of the system forces you to focus on facts, not theories. It keeps you from falling too quickly into your own beliefs or misconceptions, or those of others. [...]

Starting with the behaviour of the system directs one's thoughts to dynamic, not static analysis – not only to 'what's wrong?' but also to 'how did we get there?' and 'what behaviour modes are possible?' and 'if we don't change direction, where are we going to end up?' [...]

2. Listen to the wisdom of the system

Aid and encourage the forces and structures that help the system run itself. Don't be an unthinking intervener and destroy the system's own self-maintenance capacities. Before you charge in to make things better, pay attention to the value of what's already there. [...]

3. Expose your mental models to the open air

Remember, always, that everything you know, and everything everyone knows, is only a model. Get your model out there where it can be shot at. Invite others to challenge your assumptions and add their own. Instead of becoming a champion for one possible explanation or hypothesis or model, collect as many as possible. Consider all of them plausible until you find some evidence that causes you to rule one out. That way you will be emotionally able to see the evidence that rules out an assumption with which you might have confused your own identity. [...]

4. Stay humble. Stay a learner

Systems thinking has taught me to trust my intuition more and my figuring-out rationality less, to lean on both as much as I can, but still to be prepared for surprises. Working with systems, on the computer, in nature, among people, in organizations, constantly reminds me of how incomplete my mental models are, how complex the world is, and how much I don't know.

The thing to do, when you don't know, is not to bluff and not to freeze, but to learn. The way you learn is by experiment – or, as Buckminster Fuller put it, by

trial and error, error, error. In a world of complex systems it is not appropriate to charge forward with rigid, undeviating directives. 'Stay the course' is only a good idea if you're sure you're on course. Pretending you're in control even when you aren't is a recipe not only for mistakes, but for not learning from mistakes. What's appropriate when you're learning is small steps, constant monitoring, and a willingness to change course as you find out more about where it's leading. [...]

5. Honour and protect information

A decision-maker can't respond to information he or she doesn't have, can't respond accurately to information that is inaccurate, can't respond in a timely way to information that is late. I would guess that 99 percent of what goes wrong in systems goes wrong because of faulty or missing information.

If I could, I would add an Eleventh Commandment: Thou shalt not distort, delay or sequester information. You can drive a system crazy by muddying its information streams. You can make a system work better with surprising ease if you can give it more timely, more accurate, more complete information. [...]

6. Locate responsibility in the system

Look for the ways the system creates its own behaviour. Do pay attention to the triggering events, the outside influences that bring forth one kind of behaviour from the system rather than another. Sometimes those outside events can be controlled (as in reducing the pathogens in drinking water to keep down incidences of infectious disease). But sometimes they can't. And sometimes blaming or trying to control the outside influence blinds one to the easier task of increasing responsibility within the system.

'Intrinsic responsibility' means that the system is designed to send feedback about the consequences of decision-making directly and quickly and compellingly to the decision-makers. [...]

7. Make feedback policies for feedback systems

[...] You can imagine why a dynamic, self-adjusting system cannot be governed by a static, unbending policy. It's easier, more effective, and usually much cheaper to design policies that change depending on the state of the system. Especially where there are great uncertainties, the best policies not only contain feedback loops, but meta-feedback loops – loops that alter, correct and expand loops. These are policies that design learning into the management process.

8. Pay attention to what is important, not just what is quantifiable

Our culture, obsessed with numbers, has given us the idea that what we can measure is more important than what we can't measure. You can look around

and make up your own mind about whether quantity or quality is the outstanding characteristic of the world in which you live.

If something is ugly, say so. If it is tacky, inappropriate, out of proportion, unsustainable, morally degrading, ecologically impoverishing, or humanly demeaning, don't let it pass. Don't be stopped by the 'if you can't define it and measure it, I don't have to pay attention to it' ploy. No one can precisely define or measure justice, democracy, security, freedom, truth or love. No one can precisely define or measure any value. But if no one speaks up for them, if systems aren't designed to produce them, if we don't speak about them and point toward their presence or absence, they will cease to exist.

9. Go for the good of the whole

Don't maximize parts of systems or subsystems while ignoring the whole. [...] Aim to enhance total systems properties, such as creativity, stability, diversity, resilience and sustainability – whether they are easily measured or not.

As you think about a system, spend part of your time from a vantage point that lets you see the whole system, not just the problem that may have drawn you to focus on the system to begin with. And realize that, especially in the short term, changes for the good of the whole may sometimes seem to be counter to the interests of a part of the system. It helps to remember that the parts of a system cannot survive without the whole. [...]

10. Expand time horizons

The official time horizon of industrial society doesn't extend beyond what will happen after the next election or beyond the payback period of current investments. The time horizon of most families still extends farther than that – through the lifetimes of children or grandchildren. [...] The longer the operant time horizon, the better the chances for survival.

In the strict systems sense there is no long-term/short-term distinction. Phenomena at different timescales are nested within each other. Actions taken now have some immediate effects and some that radiate out for decades to come. We experience now the consequences of actions set in motion yesterday and decades ago and centuries ago. [...]

11. Expand thought horizons

[...] Seeing systems whole requires more than being 'interdisciplinary', if that word means, as it usually does, putting together people from different disciplines and letting them talk past each other. Interdisciplinary communication works only if there is a real problem to be solved, and if the representatives from the various disciplines are more committed to solving the problem than to being

academically correct. They will have to go into learning mode, to admit ignorance and be willing to be taught, by each other and by the system.

It can be done. It's very exciting when it happens.

12. Expand the boundary of caring

Living successfully in a world of complex systems means expanding not only time horizons and thought horizons; above all it means expanding the horizons of caring. There are moral reasons for doing that, of course. And if moral arguments are not sufficient, then systems thinking provides the practical reasons to back up the moral ones. The real system is interconnected. No part of the human race is separate either from other human beings or from the global ecosystem. It will not be possible in this integrated world for your heart to succeed if your lungs fail, or for your company to succeed if your workers fail, or for the rich in Los Angeles to succeed if the poor in Los Angeles fail, or for Europe to succeed if Africa fails, or for the global economy to succeed if the global environment fails. [...]

13. Celebrate complexity

[...] Let's face it, the universe is messy. It is non-linear, turbulent and chaotic. It is dynamic. It spends its time in transient behaviour on its way to somewhere else, not in mathematically neat equilibria. It self-organizes and evolves. It creates diversity, not uniformity. That's what makes the world interesting, that's what makes it beautiful, and that's what makes it work. [...]

14. Hold fast to the goal of goodness

[...] The gap between desired behaviour and actual behaviour narrows. Fewer actions are taken to affirm and instill ideals. The public discourse is full of cynicism. Public leaders are visibly, unrepentantly, amoral or immoral and are not held to account. Idealism is ridiculed. Statements of moral belief are suspect. It is much easier to talk about hate in public than to talk about love.

We know what to do about eroding goals. Don't weigh the bad news more heavily than the good. And keep standards absolute. [...]

And so we are brought to the gap between understanding and implementation. Systems thinking by itself cannot bridge that gap. But it can lead us to the edge of what analysis can do and then point beyond – to what can and must be done by the human spirit.

Donella H. Meadows, extracts from 'Dancing with Systems' (text excerpted from the manuscript of the author's last, unfinished book). © The Donella Meadows Institute. (www.donellameadows.org)