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**Understanding complex systems: Lessons for leadership**

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Whatever the virtues of past approaches to leadership, many are maladapted to solving our most complex problems. A reason for this is that most of our ideas about leaders and followers are not grounded in a key scientific insight; namely, that we are complex systems that are embedded in other complex systems. If we want to solve our toughest problems we need new ideas about leadership that are grounded in this emerging understanding of who we are and our place in the world.

To focus our minds on why we need a fresh look at leadership, I will focus on some key complexities that leaders must understand if they are to resolve our most challenging problems. I'll begin with a brief sketch of the state we're in to set the scene for what is to follow. Next, I'll describe three complexities that are common to the problems that we find most intractable. Finally, I'll conclude with a short list of lessons for leaders in complex systems.

## The state we're in

Some very serious cracks are beginning to appear in the capacity of our communities and ecosystems to sustain our wellbeing. For example, recent years have witnessed escalating health, social, economic and environmental crises. Many more are on the horizon. Although we are justifiably worried about these crises, we should be rather more worried than we are by their underlying causes. The simple reason for this is that crises are almost always symptoms of more complex, systemic problems.

By and large, our responses to crises reflect our tendency to focus on the short-term; on what ails us in the here and now. When confronted with a crisis, we tend to implement quick fixes. Rarely do we implement long-term sustainable solutions. Unhappily, if a problem is not vivid enough we don't even attempt quick fixes. The response to the recent global financial crisis is a paragon example of the former.

The running sore that is our response to climate change is a dispiriting example of the latter. Many more examples could be offered. Our list of tough economic, social and environmental problems is now very long indeed. Despite the superfluity of talk about our most serious problems, a discrepancy exists between what we ought to do—scientifically and ethically—and what we actually do. In consequence, our anxieties about the future escalate. Frustrations mount. Hope and purpose dissipate.

There is a pervasive sense that something is profoundly wrong with the way we with live today. Even in the affluent West, especially the Anglo-American part, which includes Australia, there is a growing sense that all is not well. This unease is reflected in critiques of senior figures in both the government and private sectors. Claims of mismanagement are common, as are claims about leadership failures, crises and vacuums. That many claims of mismanagement are levelled at leaders is revealing. The implication is that we are over-managed and under-led.

If public trust in the ability of leaders to navigate us through these volatile, uncertain times is low, our trust in their moral compass is lower still. We have all heard the pleas for more ethical leadership. At a time when government or corporate scandals seem to be reported every other day, increasing the practice of ethical leadership may well help remedy what ails us.

At minimum, a stronger focus on ethical leadership might serve as a countervailing force against what the philosopher John Ralston Saul calls the marginalization of ethics. The marginalization of ethics occurs when we fail to act on what we know. It occurs when we knowingly implement quick fixes rather than sustainable solutions. It occurs when we assert that short-term need—that is, our needs, in the here and now—overwhelm all other considerations.

Then again, a stronger focus on ethical leadership may have no effect at all. Consider, for example, the fact that it has been known for decades that our toughest social and environmental problems have deep, systemic roots. Jay Forrester's *World Dynamics* model produced for the Club of Rome in the early 1970s is a well-known example of these ideas. The contemporary climate modelling by the IPCC is more familiar still.

These models have clear ethical dimensions, and a sharp existential edge. Our leaders have long known about these models and their implications. Many are well schooled in ethics. And yet, we continue to hear a long litany of explanations that short-term need overwhelms all else. All of this is to say that information about

the systemic nature of our toughest problems is publically available and that it has been for a very long time. The blame for the failure by our leaders to act on what they know is properly attributable to them. Claims about leadership failures are not without merit.

There is, however, another major group that warrants consideration, which has so far escaped comparable scrutiny: us. Although it true that our leaders have made a number of unethical and unwise decisions, it is also true that we, as citizens, have sanctioned many of them. Much of the information that is available to our leaders is also available to us. We, too, are schooled in ethics. Part of the fault, therefore, must lie with us.

Irrespective of how we apportion blame for our problems and however hard we try to resolve them, one thing is clear: we are stuck. How do we get unstuck?

## The nature of complex problems

However useful ethics is in navigating simple social systems—those comprised of family, friends, colleagues and acquaintances—the usefulness of ethics is limited in complex social systems. When navigating complex social-ecological systems—that is, the world in which we live—ethics is inadequate. To navigate these linked social-ecological systems, we need something more; namely, systems thinking.

Systems thinking is a key skill needed to make sense of complex systems. Still too few people are familiar with systems thinking, and this is as true of our leaders as anyone. Although it's beyond the scope of this talk to review systems thinking, it is nevertheless important to have a basic grasp of the complexities that systems thinkers strive to understand. We, all of us, especially leaders, must understand these complexities because they are at the heart of the toughest challenges we face. These are dynamic, social, and generative complexity. I'll review each in turn.

### Dynamic complexity

Challenges are dynamically complex when cause and effect are interdependent and far apart in space and time. Although we are fairly good at understanding cause and effect, it turns out that some learning environments distort this understanding.

In kind learning environments, cause and effect are close in space and time and are easily observed, which leads people to learn the right lessons about causality and to develop accurate intuitions about how the world works. By contrast, in wicked learning environments, cause and effect are far apart in space and time and not easily observed, which leads people to learn the wrong lessons about causality and to develop inaccurate or misleading intuitions about how the world works.

Consider a simple example of a kind learning environment. If you were unfortunate enough to put your hand on a stovetop when it was hot, you would, of course, feel burning pain the very instant you made contact. This environment teaches the right lessons about causality and promotes intelligent behaviour; that is, one is unlikely to make that mistake again.

Now, consider an example of a wicked learning environment. Imagine this time that after putting your hand on the stovetop, a burning sensation is not experienced until a week afterwards. In this instance, cause and effect are far apart in space and time. It would not occur to you that the source of the pain was the event that occurred a week earlier. To make the problem, and the system, even more complex, imagine that it was not your hand that experienced the pain but rather the hand of a different person in a different household. In this case, cause and effect are far apart in space and time, as well as being socially removed. These environments teach precisely the wrong lessons about cause and effect. Complex systems are counterintuitive.

### Social complexity

Challenges are socially complex when the actors involved have different perspectives and interests. Our world is riddled with socially complex challenges. As new connections form between people, organisations, and economies, the social complexity of our world and our problems increases. Often we are not fully aware of the

social complexity we generate when we create these new interconnections. Consider, for example, the proliferation in recent years of international treaties, such as multi-lateral trade agreements. Putting aside the assurances from experts that attend the creation of these agreements, we often have no idea about how these socially complex structures will behave once they are up and running.

### **Generative complexity**

Finally, challenges are generatively complex when the future is fundamentally unfamiliar, uncertain and undetermined. Our world is full of this type of complexity, which is amply attested to by our escalating anxieties about the future. The generative complexity of the world and our challenges have increased in recent years as we have dismantled many of the stabilizing policies and institutions put in place at the end of the Second World War. We have now entered an age of insecurity. Risk and vulnerability are once again features of everyday life.

There are limits to how much disturbance a system can absorb before these changes overwhelm a system's capacity to adapt. By creating new economic and social interdependencies, by removing stabilizers and eroding stocks of material and social resources, and by remaining oblivious the effects of our actions because cause and effect are far apart in space and time, we have unwittingly increased the vulnerability of individuals, organizations, communities, and ecosystems alike.

### Lessons for leadership

Let me conclude by offering a short list of lessons for leaders who want to understand our complex problems and to contribute to their resolution. These lessons will be mapped onto the three types of complexity that I've just outlined.

#### **The challenges of dynamic complexity**

As explained earlier, a challenge is dynamically complex when cause and effect are interdependent and far apart in space and time. The key lesson for leadership here is that dynamically complex problems cannot be successfully addressed piece by piece, but only by seeing the system as a whole. However, as should now be clear, most of our learning takes into account only what is observed, which means that most of us are bad at understanding the structure of complex systems. Most of us cannot see the whole.

If the constraints of our learning mechanisms were not bad enough, consider also that we are endowed with a host of unconscious biases that blind us to interconnections across time and space. To give you a sense of just how bad we are at seeing these connections, consider this recent finding from social psychology: most of us don't believe that our future selves—selves that exist, say, 10 years from now—are actually, truly us. Further, many people regard their future selves as less *human* than their current selves. Our ability to imagine our connections to other people, to say nothing of their humanity, is much, much worse.

Although we have various capacities and tools to help us escape the here and now, such as imagination, ethics, and systems thinking, too many of us remain stranded in the present. Many people, including far too many of our leaders, simply can't 'see' the connections that comprise complex systems, let alone grasp that our toughest problems have systemic roots. Learning how to remedy our inability to see complex systems, or to produce adaptive change in systems in spite of it, is a major leadership challenge.

#### **The challenges of social complexity**

I noted earlier that a challenge is socially complex when the actors involved have different perspectives, interests, values and mental models. The key lesson for leadership here is that socially complex problems cannot be successfully addressed by experts or authorities, but only with the engagement of the actors themselves. This insight means that people who neither understand, nor agree, nor trust one another must cooperate with one another. Clearly, this is not a defining feature of our culture. A cursory inspection of our politics confirms this. The state of affairs between government and the private sector often seems little better.

Another part of the solution involves engaging less with experts and authorities—who tend to operate at a safe remove from most problems—and engaging more with the actors involved. To do so, we must address another unconscious bias, which is to overrate the insight, wisdom and contribution of experts and authorities and to underrate our own insight, wisdom and contribution. We would do well to remember that we are the actors on the ground; reality is here, with us, not located in distant seats of power such as Canberra or the US or, once upon a time, Britain. We now live in a world without an imagined centre, but are yet to take this insight truly to heart.

### **The challenges of generative complexity**

Finally, you'll recall that a challenge is generatively complex when the future is unfamiliar, uncertain and undetermined. The key lesson for leadership here is that generatively complex problems cannot be addressed by applying so-called 'best practice' solutions, but only by developing new solutions. Let me offer some thoughts about a key criterion against which any new solutions should be judged.

One of the virtues of systems thinking is that it draws our attention away from the individual parts of a system, whether persons, organizations or species, to the system as a whole. It is in the context of thinking about whole systems that the concept of resilience, as we now understand it, was developed.

A critical insight has emerged from resilience research, which is relevant to any new solutions we might develop. Here's the first part of the insight: humans are excellent short-term optimizers; that is, we are extremely good at identifying and removing redundancies and maximizing efficiency. Efficiency, of course, is a value of overarching importance in our society and a defining feature of most of the solutions we offer to the problems we encounter.

Now, here's the second part of the insight—the most important part: the efficiency of a system is often inversely related to its resilience. That is, as a system's efficiency increases, its resilience decreases. The removal of those aspects of a system that are thought to be redundant often reduces the response diversity of a system and, by extension, a system's capacity to withstand shocks and disturbances. Efficient systems work wonderfully well when the world is stable and the future is known. They are counterproductive when the world is unstable and the future unfamiliar.

In a world suffused with generative complexity, a key criterion against which any new solutions must be judged is whether they increase the response diversity and resilience of systems, not decrease it. According to this criterion, the current focus on increasing the number of women in leadership is a step in the right direction but, as should now be quite clear, is nowhere near enough to increase the response diversity and resilience of our organizations, communities and ecosystems.

### **A shift of mind**

Ultimately, solving our toughest problems requires a shift of mind. It requires that we see ourselves less as autonomous entities and more as psychobiological systems that are nested in social systems that are, in turn, nested in ecosystems. This view of our place in the world requires that we focus not just on the parts of a system, but also on the processes through which parts interrelate. It requires that we learn to see the overall pattern of organization created by these interactions. Changing mindsets—our most basic assumptions about how the world works—is the most powerful way to create change in complex systems. Effecting this shift of mind is the biggest challenge in the century ahead and is a challenge that must be met by us all, not just our leaders.