2

The Truth About Complex Systems

The idea of complex systems is nothing new. But while seemingly self-explanatory, these two words are actually a nebulous, abstract concept in evaluation, research, and improvement practice. For years, I thought I truly understood complex systems: A whole set has interrelated, dependent parts, and a change to one part results in a consequential change to another part. True. But effecting change within complex systems, especially where many of our persistent societal problems live, requires a deeper understanding of complexity science and systems thinking. This chapter continues our journey into leading change through evaluation by furthering our vital understanding of these ideas and illuminating the need for embracing the perspectives and experiences of actors within these systems.

In this chapter, I cover:

- Systems and Complexity Science
  - Complex Adaptive Systems
  - The Cynefin Framework
  - Causal Feedback Loops
- Learning Your Way Through Problems
- Multiple and Inclusive Perspectives: The Need for Embracing Actors Within the System
- Building Capacity for Participatory Approaches

Systems and Complexity Science

Donella Meadows (2008), one of the leading systems thinkers, defines a system as "an interconnected set of elements that is coherently organized in a way that achieves something" (p. 11). According to Meadows, a system "must consist of three kinds of things: *elements*, *interconnections*, and a *function* or *purpose*" (p. 11).

Systems also have espoused purposes: what the system is promoted as doing (e.g., providing a quality education to all students). And systems have actual purposes: what the system is actually producing due to its current design, whether intended or unintended (Stroh, 2015). Persistent problems often exist within complex systems when their actual system patterns are in conflict with their espoused purposes (Stroh, 2015).

As an example, we can consider a hospital. A hospital is a system with elements consisting of doctors, patients, medicine, operating rooms, and so on. These elements are interconnected through policies, procedures and administrations for the espoused system purpose of providing quality health care. Now consider the alarming statistic that pregnancy-related mortality rates for Black women are over three times that of their white counterparts (Petersen et al., 2019). There is a systemic inequity. Actual system patterns are in direct conflict with the espoused purpose of the hospital (Rohanna & Christie, in preparation).

EXAMPLE 2.1

EDUCATION SYSTEM IN CONFLICT WITH ESPOUSED PURPOSE

K–12 education is another example of a complex system with serious conflicts with its espoused purpose. The K–12 system is composed of schools interconnected through curriculum and assessment policies and providers, federal policies such as Every Student Succeeds Act, and widespread structural and instructional norms on "how to teach." While the education system exists to provide a quality education and help all students succeed, the system does not consistently achieve its espoused purpose. This is particularly true for students of color and those designated as low-income. Again, a troubling, persistent, and systemic problem.

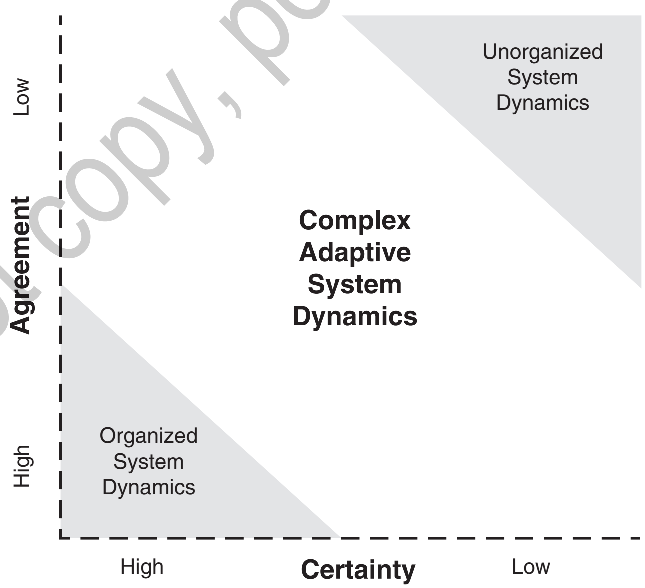
Note: Although more could be said about the education system and its history of systemic oppression as the reason for why the system is designed to achieve the results it does, this book assumes that many educators are working in the system today to improve these injustices yet struggle with their goals because of the complexity of the system.

To diagnose, understand, and improve persistent problems within complex systems, we must first have a deeper understanding of complexity and system dynamics. There are various frameworks for conceptualizing why problems persevere in complex systems. In this chapter, I describe three.

Complex Adaptive Systems

Complex Adaptive Systems is a complexity theory based on the work of Ralph Stacey (1996) and Brenda Zimmerman et al. (1998) that considers social systems on a range of two factors: agreement and certainty. Agreement refers to agreement among individuals in groups, teams, and organizations about their priorities and the activities in which they engage. Certainty refers to the cause and effect predictability of relationships among actions, conditions, and consequences (Parsons, 2012; Stacey, 1996; Zimmerman et al., 1998; Zimmerman & Dooley, 2001). System dynamics can be categorized around the degrees of agreement and certainty (Figure 2.1). System dynamics refers to emergent and changing interactions among elements within a system(s) (American Evaluation Association Systems in Evaluation Topical Interest Group, 2018). In this framework, they can be described as one of three types: organized, adaptive (self-organizing), and unorganized.

FIGURE 2.1 ● CAS System Dynamics



Source: Adapted from Parsons, B. (2012). Using Complexity Science Concepts When Designing System Interventions and Evaluations. http://insites.org/resource/using-complexity-science-concepts-when-designing-system-interventions-and-evaluations/

- **Organized System Dynamics:** When the degrees of agreement and certainty are high, the system dynamics tend to be stable, organized, and predictable. Organizations such as manufacturers are very structured with hierarchical chains of command and can assume this type of system dynamic. For example, an increase in labor hours—assuming the workers are in accord—may reliably result in an increase in production.[1]

  Evaluations and research that predict a linear cause and effect relationship of an action to an outcome implicitly (or explicitly) make the assumption of operating within organized system dynamics. For example, in some hierarchical structures such as schools, it may be expected that there is high agreement among administrators, teachers, and parents in implementing interventions to help student learning and the assumption that providing an intervention, if it is effective, will lead to an improved student outcome (effective intervention -> improved student outcome). However, these assumptions may not always hold true, particularly if the system dynamics lean toward self-organizing rather than organized.

- **Complex Adaptive System Dynamics:** Between organized and unorganized system dynamics falls adaptive system dynamics, also referred to as *self-organizing and complex adaptive systems* (CAS) (i.e., a complex system). In a system with this dynamic, there are many semi-independent and diverse agents who continually adapt to their interactions with each other and their environment and may act in unpredictable ways (Parsons, 2012). While not completely organized—that is, not a high degree of agreement or certainty to the system behaviors—system patterns do exist. Furthermore, control in these systems is distributive rather than centralized. Agents can be influenced rather than directly ordered to follow or behave in certain ways. It is through identifying high leverage areas for influence that self-organization dynamics can be understood and leveraged to effect positive change (Parsons, 2012).

  Organizations where there is structure, but also autonomy of its diverse actors, may assume this system dynamic. Schools and hospitals, although structured, may fall into this category. Both teachers and doctors have the autonomy to make their own decisions based on their interactions with system elements. While there are policies and processes in place, their actions usually cannot be dictated. They can, however, be influenced. Additionally, there are many diverse agents in education and health care systems.

[1] That is, it could be expected to increase up to a certain point based on the economic law of diminishing returns.

- **Unorganized System Dynamics:** At the other end of the spectrum, where the degrees of agreement and certainty are low, the system dynamics tend to be random and disorganized. Systems have basically collapsed actions, and events are unpredictable and seem disconnected with no discernable patterns (Parsons, 2012). Hurricane Maria, which devastated Puerto Rico in September 2017, is an example of unorganized system dynamics. The event and aftermath were seemingly chaotic because the storm damaged cell towers, roads, an already precarious electrical grid due to the recent Hurricane Irma, and more. Low agreement among key actors, such as the White House administration, Puerto's Rico's administrative officials, and the Federal Emergency Management Agency about priorities and necessary actions contributed to the instability of the event.

The Cynefin Framework

The Cynefin Framework is a sense-making framework to help leaders make decisions when faced with complexity. Developed by Snowden, Boone, and Kurtz, it incorporates complexity science and organizational theory (Kurtz & Snowden, 2003; Snowden & Boone, 2007). Their use of the Welsh word "Cynefin" (pronounced ku-nev-in) recognizes that "all human interactions are strongly influenced and frequently determined by the patterns of our multiple experiences" (Kurtz & Snowden, 2003, p. 467). They posit that the assumptions of order, rational choice, and intentional capability (i.e., actions by others are deliberate) do not hold true in all contexts even though many tools and strategies assume they do. There are five delineated contexts in which to make sense of situations and act accordingly: simple, complicated, complex, chaotic, and disorder. These categories are codified by predictive abilities, the character of the relationship between cause and effect.

- **Simple:** Simple contexts tend to be stable, with clear cause and effect relationships among elements. In this context, managing situations is straightforward and the answer is usually apparent. Leaders must sense, categorize, and respond to situations, potentially drawing on similar past experiences or best practices. This is the realm of the "known knowns" (Snowden & Boone., 2007, p. 2). This categorization is similar to organized system dynamics in CAS theory. A machine breaks down in a manufacturing plant. The shift manager (i.e., leader) calls the plant's mechanic to fix it.
- **Complicated:** Complicated contexts also tend to have cause and effect relationships; however, these relationships may not be fully known or apparent to everyone. There also may be multiple correct and knowable options that a leader can take to address a situation. A leader in this context must sense and analyze (rather than simply

categorize) to respond to situations and may often need to seek expert guidance. This is the realm of the "known unknowns" (Snowden & Boone., 2007, p. 3). An automotive executive wants to improve diminishing sales of a prevalent car and seeks experts in the company to develop a new fresh model. While the change could predictability boost sales, the market's preference may be unclear. The situation requires analysis and innovation.

- **Complex:** Like Complex Adaptive Systems, complex contexts in the Cynefin Framework are characterized by unpredictability, no apparent cause and effect relationships, and emergent patterns. The context is interdependent: A change in one place can result in a change in another (i.e., interconnections among elements). Patterns cannot be predicted but they can be understood, and importantly, understood from multiple perspectives. Rather than trying to impose best practices or known solutions, a leader in a complex context should provide the safe space for the best course of action to emerge and conduct experiments to learn. Snowden and Boone (2007) provide an example to illustrate this idea:

> There is a scene in the film *Apollo 13* when the astronauts encounter a crisis ("Houston, we have a problem") that moves the situation into a complex domain. A group of experts is put in a room with a mis-match of materials—bits of plastic and odds and ends that mirror the resources available to the astronauts in flight. Leaders tell the team: This is what you have; find a solution or the astronauts will die. None of those experts knew a priori what would work. Instead, they had to let a solution emerge from the materials at hand. And they succeeded. (p. 5)

- **Chaotic:** In chaotic contexts, cause and effect relationships are unknowable because they are constantly shifting. Patterns cannot be identified, and thus, cannot be leveraged or managed. This is the realm of the "unknowables." With no known right answer, leaders must act swiftly and decisively, because most of these situations arise due to a crisis. Snowden and Boone use the events of 9/11 as an example of a situation that falls into this context (Snowden & Boone., 2007, p. 5).
- **Disorder:** The fifth category of disorder applies only when the other four contexts cannot be discerned. The Cynefin Framework does not provide guidance for leadership actions in this state.

Causal Feedback Loops

Causal feedback loops are components of system dynamics modeling. System dynamics modeling was developed by Jay Forrester and other scholars at Massachusetts Institute Technology in the late 1950s. System dynamics modeling provides a framework for understanding system patterns, including feedback mechanisms and system pressures. These feedback mechanisms and underlying pressures shape a system's behavior—think of vicious or virtuous cycles—and thus, give insight into a system's actual purpose versus its espoused purpose.

Because systems dynamics modeling including stocks and flows and in-depth computer simulations built from diverse data representing numerous variables encompasses more than is discussed in this chapter, I have chosen instead to refer to the framework discussed here as *causal feedback loop diagrams*.

Causal feedback loop diagrams equate the same ideas but in a more practical way that can be implemented by those not familiar with computer simulation modeling. Rather, the tools of causal feedback loops can be applied with a pen, paper, and a knowledgeable team using continuous improvement cycles of inquiry.

Peter Senge (2006) introduced the idea of causal feedback loop diagramming to a more mainstream public with his book *The Fifth Discipline*. In his book, he discussed the five disciplines necessary for a learning organization. He referred to the fifth discipline—systems thinking—as the cornerstone of a learning organization.[2] Systems thinking refers to the ability to see the whole rather than the parts (interconnections) and for understanding how underlying structures and pressures drive a system's behavior.

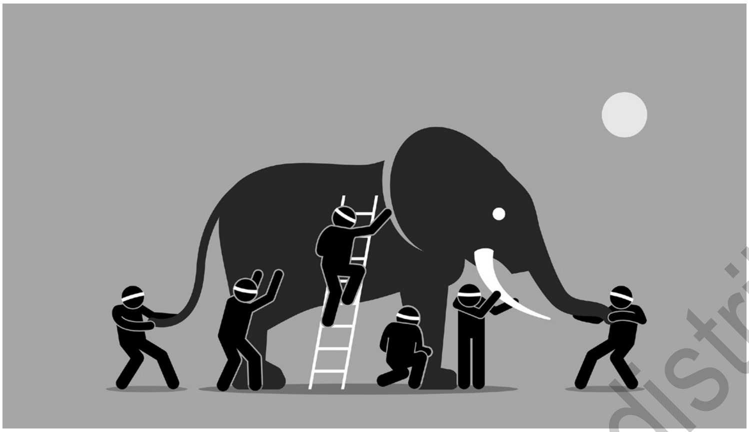
"Every system is perfectly designed to get the results it gets."[3] Causal loop diagramming is a tool for understanding how a system is designed, whether intentionally or unintentionally, to lead to certain outcomes. Thus, rather than a theory primarily about understanding complexity like Complex Adaptive Systems or the Cynefin Framework, causal loop diagramming is a strategy for addressing complexity. As such, this chapter devotes more space to its description.

David Peter Stroh (2015), a colleague of Senge's, uses the parable of the blind men and the elephant to explain systems thinking. In the parable, there are six blind men who are curious about elephants, a great beast they had often heard about but obviously never seen. One day, an elephant came to their village. They sought it out to learn more about it. The first blind man touched the side of the elephant and exclaimed, "It is like a wall." The second man touched the tusk. "It is strong and smooth," he said. The third, who touched the trunk, claimed, "It is like a snake." The fourth touched the elephant's legs and declared, "It is like a tree." The fifth man touched the elephant's ears and said, "It is like a fan." Last, the sixth man felt the elephant's tail and noted,

[2] The other four disciplines are continually working toward personal mastery, understanding and working with mental models, building a shared vision, and team learning.

[3] While this quote has been attributed to different authors over the years, it was most likely first stated by Paul Batalden from the Institute for Healthcare Improvement. More information can be found at http://www.ihi.org/communities/blogs/origin-of-every-system-is-perfectly-designed-quote.

FIGURE 2.2 ● Blind Men and the Elephant



iStock.com/leremy

"It is like a rope." Not understanding why each of them had such different perceptions, they began arguing with each other, each claiming that they were correct. A wise man who was passing by heard them arguing. He stopped and told that they were all correct. The blind men were shocked and did not understand how that was possible. The wise man stated that they each touched a different part of the elephant and the whole elephant consisted of all those different traits.

Like the blind men, many of us work in organizations and systems where we may not initially see the whole. Instead, we tend to see the part that is in front of us and may struggle with another's perspective because it does not represent our own. Systems thinking is a way to see the whole elephant.

This parable highlights one of three valuable concepts necessary for systems thinking: multiple perspectives (Williams & Iman, 2007). People can have different views about the same system, and the same problem. Interrelationships, which we have already touched on, and boundaries are the other two concepts (Williams & Iman, 2007). To improve a problem within a large complex system, it needs to be bounded. It is not possible to address all parts of the system at once. The concept of boundaries not only refers to time and space, but also to which stakeholders are included in understanding the system. As the Newark Public School example discussed later in this chapter illustrates, those hoping to lead change need to seriously consider whose voices are being privileged and whose are being marginalized in the systems analysis (Midgley, 2007; B. Williams, 2015). Systems thinking should be inclusive.

Therefore, as an essential tool for systems thinking, those engaging in causal loop diagramming need to embrace multiple perspectives to understand system dynamics and interconnected elements, create space for sometimes marginalized voices, and bound the system to the problem they are trying to solve. Trying to diagram causal feedback loops for a whole system could be overwhelming, and potentially too macro for identifying levers of change. Rather, one should start first with the problem and bound the system and causal feedback loop to it.

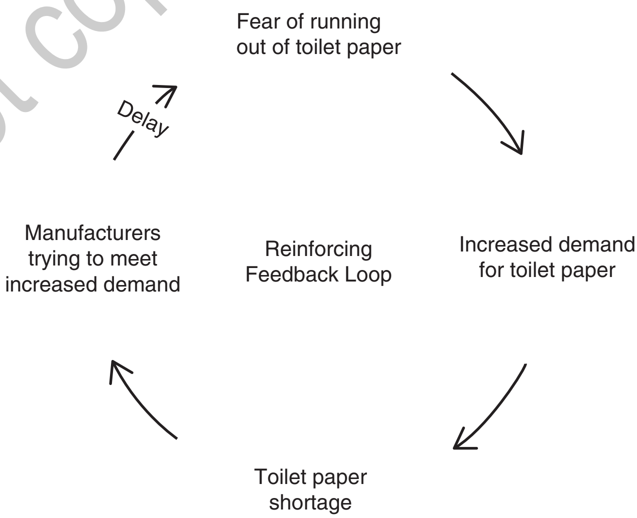
Senge (2006) refers to two types of causal feedback loops—reinforcing and balancing—as the "building blocks" of systems thinking (p. 79). In the systems thinking context, the term *feedback* does not have its typical meaning when we think about improvement: providing information or input about someone's performance, product, act, and so on. In this case, feedback refers to the idea that cyclical patterns result when a system(s) *feeds on itself*. The system's elements and interconnections are driving the system's dynamics, which importantly, may or may not be the system's espoused purpose.

Reinforcing Feedback Loops

A system demonstrating reinforcing feedback loops accelerates its rate growth or decline exponentially toward some outcome. Depending on the situation, this can create a virtuous (positive) cycle or a vicious (negative) cycle. An example of how a reinforcing feedback loop can create a vicious cycle can be found in toilet paper.

At the beginning of the COVID-19 pandemic, fearful people began stockpiling toilet paper. This caused others who did not initially fear running out of toilet paper to rush out and buy up toilet paper, too. Toilet paper manufacturers were not prepared for this sudden demand. As a result, stores actually did run

FIGURE 2.3 ● Toilet Paper Reinforcing Feedback Loop



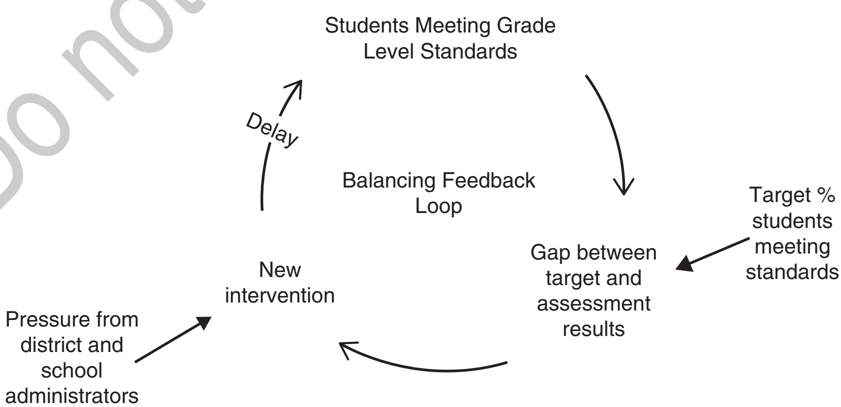
out of toilet paper. Had everyone stuck to their usual buying habits, there likely would have been enough toilet paper for everyone. This vicious cycle could only be broken by disrupting the pattern. Retailers imposed strict limits on the amount of toilet paper one could buy in a single purchase, thus allowing more shoppers to buy toilet paper during the delay when manufacturers were working hard to step up production of toilet paper and for stores to restock their shelves.

Balancing Feedback Loops

A system is stuck in the status quo when demonstrating a balancing cycle. This can be a positive if the goal is to stabilize a system, or a negative if the goal is to improve an outcome but nothing seems to change despite numerous initiatives. Balancing feedback loops are common in education systems that are striving to improve and respond to a target outcome. Figure 2.4 provides an example of this. The Smarter Balance summative assessment provides data around the percentage of students who perform at grade level in math and English Language Arts. Often in the cases where a large percentage of students do not perform at grade level, school district officials will put pressure on school administrators (e.g., principals) to meet a set target, as shown in Figure 2.4. In response, school district and school administrators may institute a new intervention and put pressure on teachers to quickly implement it. If they review the assessment results again (usually at the beginning of the next school year) and find they did not meet the target, they may deem the intervention ineffective and abandon it for a new intervention. In reality, there is often a delay before seeing improvement. This *adopt, attack, abandon* cycle is a detrimental pattern that can continue indefinitely, resulting in assessment scores hovering around the same percentage year-to-year.

Therefore, and ironically, implementing such a data-driven process, where the primary tasks are to gather outcome data and hold educators accountable,

FIGURE 2.4 ● Adopt, Attack, Abandon Balancing Feedback Loop



can result in the system being stuck in a balancing feedback loop. One reason is the concept of delays, a *normal part of any system*. However, many actors in systems, particularly those who hold others accountable, intentionally or unintentionally ignore the reality of the lag between implementation and results. Instead, they may hold a belief or assumption that change should be immediately apparent, or that others are resisting change or just not trying hard enough.

While the idea of mapping causal feedback loops seems daunting, there are many patterns common to numerous social systems. These are called *system archetypes*. Some prevalent ones are shown in Example 2.2, but there are many more. Understanding these archetypes can be very helpful for diagnosing, responding, and changing non-beneficial causal feedback patterns. More information about these archetypes can be found in Senge's and David Peter Stroh's writings (Senge, 2006; Senge et al., 1994; Stroh, 2015).

EXAMPLE 2.2

COMMON SYSTEM ARCHETYPES IN EDUCATION

Fixes That Fail: This system pattern represents the idea of implementing a quick solution to fix an immediate problem, but in actuality it leads to unexpected long-term consequences that hinder the desired improvement. A real-world example would be the aforementioned (Chapter 1) California community colleges move to require many incoming students to take remedial math courses in preparation for college-level courses. This "fix" resulted in the long-term consequence of some students dropping out rather than succeeding because taking more math classes created more opportunities to fail a course.

Shifting the Burden: This is another common system pattern that occurs when the burden of a problem is shifted to other issues or people. In education, an example of shifting the burden was the popular notion that students were to blame for low math grades and assessment scores rather than a need for reevaluating instructional practices. This trend suggested that many students did not have a *growth mindset* or a belief that they could develop their math abilities, and this was why they did not learn math. Unfortunately, this idea became so popular that many educators focused on student effort and motivation to persist, with less attention paid to whether students were being taught the tools and strategies to solve a math problem in the first place.

Accidental Adversaries: Ironically, this system pattern can result when there are too many good intentions and too many providers who want to help. There are so many outside helpers (e.g., university, foundations) who are advocating and supporting initiatives to help students, they begin to compete for teachers' time and attention. Nonprofits may also struggle with the accidental adversaries system when numerous funders push programs and interventions that result in too many endeavors, essentially competing against each other for time and resources.

Understanding system patterns requires using systems thinking tools such as causal feedback loops, system archetypes, driver diagrams, and actor maps, to name a few. By using these tools, evaluators can begin to understand the levers for systems change. For example, with accidental adversaries, one would consider how to improve the communication with outside funders and facilitate systemic conversations so everyone can see the role they play. What programs or initiatives might they give up to support the greater system goal (Stroh, 2015)?

Learning Your Way Through Problems

In complex systems, the notions of predictability and linear thinking are thrown out the window and replaced by nonlinearity, unpredictability, emergence, and system patterns. These concepts can be challenging in evaluation, where causal links tend to be conceptualized as flowing in one direction, linear, and predictive (think logic model). Thus, there may be an implicit assumption of operating within an organized system in many evaluations (Rohanna & Christie, in preparation).

All three of these frameworks suggest that our usual evaluation modus operandi may not fit this relatively new understanding of the paradigm of complexity. It is imperative for evaluators who are seeking to lead change to gain an understanding of complex system dynamics. The American Evaluation Association Systems in Evaluation Topical Interest Group (AEA SETIG) identifies systems evaluation principles that connect to the systems and complexity ideas already discussed. These principals can be found on their website and are organized around the concepts of interrelationships, perspectives, boundaries, and dynamics.[4]

Ideally, evaluators could use the complexity science and systems thinking ideas posited in this book, which connect to the SETIG principles, to understand how to diagnose, respond to and reset system patterns, and how to engage methods for utilizing and responding to emergence. Continuous improvement grounded in improvement science is one approach that evaluators can adopt for working with these concepts, particularly when considering complex systems' traits of unpredictability and emergence.

Let's return to the Apollo 13 example. In April 1970, Apollo 13 was on its way to the moon. Just 2 days into the mission, an oxygen tank exploded, putting the astronauts' lives in grave jeopardy. NASA leapt into action. Mission Control Flight Director Gene Kranz announced to his controllers, "Let's solve the problem, but let's not make it any worse by guessing" (Cass, 2005, Part 1 p. 5). In the 1995 film, *Apollo 13*, the crisis spawned two of the most famous movie quotes of all time: "Houston, we have a problem," and "Failure is not an

[4]https://www.systemsinevaluation.com/wp-content/uploads/2018/10/SETIG-Principles-FINAL-DRAFT-2018-9-9.pdf

option."[5] Even if you've never seen the film, you know the lines because they now live in the American vernacular.

In reality, NASA crews were prepared to solve emerging complex problems because they had cultivated a culture of continuous improvement, as told by Stephen Cass (2005) in a series of articles titled *Apollo 13, We Have a Solution*.

When the oxygen tank exploded, the three astronauts needed to temporarily move from their damaged three-man command service module (CSM) into the landing module (LM), which was designed for two people. But there was a problem. The LM's power was off to conserve energy. Switching it on required power from the CSM, but it had lost fuel cells in the explosion and could no longer supply it. The astronauts were running out of oxygen and could not move into the LM until the power was turned on. They needed a solution, and fast.

One year earlier, Apollo 10 preflight simulations created the crisis that was now happening on Apollo 13. Apollo 10's fuel cells had failed in simulation at *almost the exact spot* they had just failed on Apollo 13.

In the Apollo 10 simulation, the crew died. Some at NASA dismissed the results. They thought the simulation was unrealistic: It required too many complex system failures to occur on both modules for it to result in actual deaths.

Luckily, the lunar module branch chief could not dismiss the simulated outcome. Over the next few months, his team ran simulation after simulation and developed solutions for multiple scenarios. Their results had not yet been officially certified by the time Apollo 13 launched. Now, they needed to pull those results "off the shelf." The team was able to move the Apollo 13 crew into the LM with only 15 minutes to spare. Continuous improvement thinking had saved the astronauts' lives.

They succeeded because rather than dismissing a previous failure they chose to learn from it. The simulations gave them the safe space and the time to learn and experiment, thereby allowing them to learn from each new unpredictable and emergent problem.

While many of society's complex problems are not the stuff of movies, they are just as important. The case study in this book, albeit less dramatic, also illustrates how professionals with diverse expertise collaborated using continuous improvement methods to first diagnose and understand the problem they were trying to solve—the high percentage of students failing math courses—and learn their way through the problem, using an iterative process for testing new solutions and responding to emergent challenges. However, methods alone are not enough. Like the story of the Apollo 13, potential solutions require the expertise and experience of those who are closest to the problem.

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[5] In actuality, Kranz never spoke those words. However, he did give an inspiring speech to his controllers to bolster their confidence that they would successfully bring the crew home. Cass, S. (2005). *Apollo 13, We Have a Solution* (Part 2). https://spectrum.ieee.org/tech-history/space-age/apollo-13-we-have-a-solution-part-2

Multiple and Inclusive Perspectives: The Need for Embracing Actors Within the System

One December night in 2009, Newark, New Jersey, Mayor Cory Booker and Governor-elect Chris Christie toured the dangerous streets of New Jersey's most populated city. As described by Dale Russakoff's *The New Yorker* article and her 2015 book, *The Prize*, Booker had invited Christie to join him on a late-night ride to learn about his crime-fighting efforts. During that tour, the two discussed the state of Newark's public schools; Booker's real motivation for extending the invitation.

Booker was an advocate of charter schools, and Christie had recently raised the issue of urban schools in his gubernatorial campaign. That night, the two made a pact to reform Newark's schools. Booker's own words best sum up the nature of that pact: "We have to grab this system by the roots and yank it out and start over. It's outrageous" (Russakoff, 2014, p. 58).

Booker's outrage was understandable. At the time, most Newark public school students were unable to read or do math at grade-level. Almost half were dropping out (Kotlowitz, 2015). School buildings were old and dilapidated. Its system of patronage jobs created a ratio of administrators and bureaucratic clerks to students that far exceeded the state's average yet did not result in better performance (Russakoff, 2014). When Booker was elected mayor of Newark in 2006, he encouraged the charter school movement. As a result, many parents pulled their children from the district, enrolled them in charter schools, and left the school district to serve students who tended to be the most economically and academically vulnerable.

Enter Mark Zuckerberg, the founder of Facebook. He was a 26-year-old billionaire, budding philanthropist, and, with his wife Priscilla Chan, searching for an education cause. In her book, Russakoff details how Booker won over Zuckerberg and enlisted him in his new initiative. The two, along with Christie, appeared on *The Oprah Winfrey Show*, where Zuckerberg announced he had pledged one hundred million dollars to Newark Public Schools, over 5 years. The audience leapt to a standing ovation. Excitement was in the air. People were hopeful for *real* transformative change. One hundred million dollars, matched by millions more, could bring about a lot of positive change.

Four years later, most of the one hundred million dollars was spent. The outside experts, consultants, and reformers had left town. The school superintendent was gone. And nothing had changed. What went wrong?

Foretelling of mistakes to come, the famous day when Oprah Winfrey's audience heard about the Zuckerberg pledge was also the same day that Newark's parents and teachers heard about it for the first time, too (Russakoff, 2014).

From the beginning, the efforts were dominated by the perspectives of well-to-do and outside reformers. A new board called the Foundation for Newark's Future was formed, composed of donors who contributed five million dollars or more (Russakoff, 2014). By the time these donors formed a community advisory board (2 years later) most of the money was already committed to outside consultants, new labor contracts, and efforts to expand charter schools (Russakoff, 2014). Despite that fact that Newark residents expressed a desire to be involved at early community engagement forums, the voices of connected, expensive, consultants who were not familiar with Newark were privileged over theirs.

Christopher Serf, the former chief deputy to the New York Schools Chancellor, and Booker's informal education advisor, created a consulting firm specifically for the Newark project. He considered system reform to be his specialty and pronounced, "I'm very firmly of the view that when a system is a broken as this one you cannot fix it by doing the same things you've always done, only better" (Russakoff, 2014, p. 67). His solution was not to rethink the system. It was to dismantle it. Serf's firm led the charge to close and consolidate schools that were deemed low-performing in favor of charter schools. Unfortunately, that left the Newark public school system and its remaining students even worse off than before.

While Russakoff's account shares many more remarkable and important details, part of the story can be summed up by the fact that outside reformers favored shifting public money to charter schools, thereby depleting resources for public schools. Their actions revealed a lack of understanding of systems thinking, while they seemed to expect better performance by a system they were actually depleting. Furthermore, because the perspectives and voices of Newark's real stakeholders—teachers, principals, and parents—were dismissed, reformers missed the opportunity to see the whole system. Reform was done *to* stakeholders rather than *with* them. And it didn't work.

Building Capacity for Participatory Approaches

As we've now seen, systems change requires an understanding of system dynamics, systems thinking, and a willingness to value the perspectives of everyone in the system. In complex systems, people are semi-independent and diverse agents who continually adapt and act in unpredictable ways (Parsons, 2012). System stakeholders are an integral part of systems change. Thus, improving problems in complex systems requires a participatory and inclusive approach.

Participatory evaluators recognized this need a long time ago. In Participatory Evaluation (PE) evaluators collaborate with a program's primary users: those who are responsible for implementing the program or are closely connected the program (Alkin, 1991; Cousins, 2003; Cousins & Earl, 1992). PE engages primary users in the actual evaluation activities, including data collection, analysis, and interpretation of results (Cousins & Earl, 1992). By doing so, PE recognizes that knowledge is socially constructed (Cousins & Earl, 1992) and intends to foster the use of evaluation results by those most positioned to make changes or improvements.

Another participatory approach, Evaluative Inquiry, also acknowledges that inquiry is a "social and communal activity in which critical organizational issues are constructed by varied and broadly based community of inquirers"

(Preskill & Torres, 1999, p. 2). Similarly, improvement science, which is also participatory, seeks to combine the experiences and knowledge of frontline practitioners with those who hold the knowledge of how to improve (profound knowledge), who in the evaluation context, would be the evaluator (Christie et al., 2017; Rohanna, in press).

Paradoxically, the strength of participatory approaches is also one of its challenges. Authentically engaging *frontline workers* or primary users in inquiry requires they have the technical knowledge and capacity to apply the evaluative inquiry or improvement activities.

Fortunately, evaluators charged with leading change and building capacity in participatory frameworks can turn to evaluation capacity building sources for guidance. Though there are several similar definitions, evaluation capacity building can be succinctly defined as "an intentional process to increase individual motivation, knowledge, and skills, and to enhance a group or organization's ability to conduct or use evaluation" (Labin et al., 2012, p. 308).

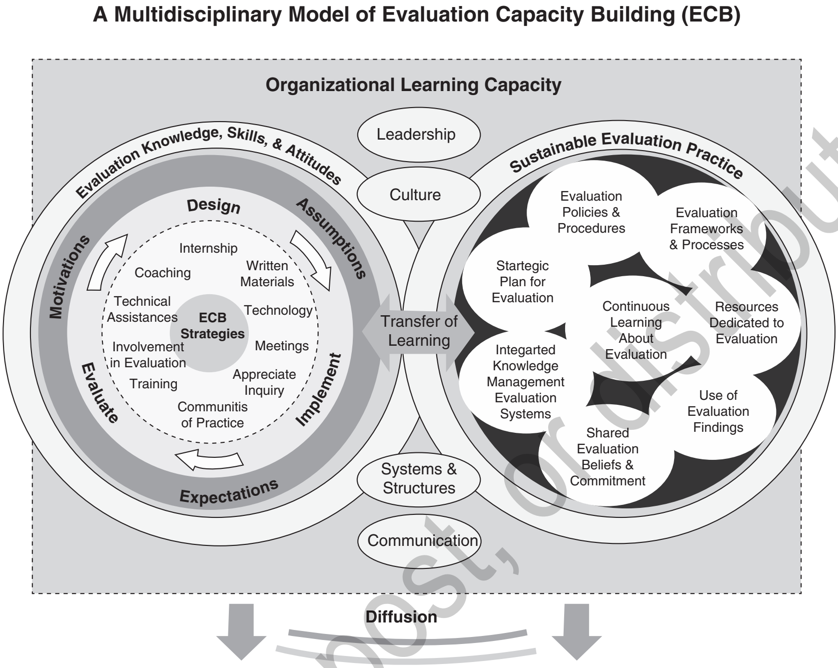
Preskill and Boyle (2008) conceptualized a multidisciplinary model to guide practitioners in developing evaluation capacity. Their model drew on the fields of evaluation, organizational learning and change, and adult and workplace learning theories. Their model is shown in Figure 2.5.

First, the model designates the goal of evaluation capacity building as the development of evaluation knowledge, skills, and attitudes. It further acknowledges that those who initiate evaluation capacity building activities have various motivations, assumptions, and expectations regarding what they hope to achieve. Depending on these and the intended objective, there are 10 different evaluation teaching and learning strategies that can be employed:

1. Internship
2. Written Materials
3. Technology
4. Meetings
5. Appreciative Inquiry
6. Communities of Practice
7. Training
8. Involvement in Evaluation
9. Technical Assistance
10. Coaching

According to Preskill and Boyle's model, the learning needs to be transferred to the work context for this individual capacity to be sustained. Their model further deconstructs the processes, practices, policies, and resources required

FIGURE 2.5 ● Preskill & Boyle's Multidisciplinary Evaluation Capacity Building Model



for sustainable evaluation practice. Examples of these include the use of evaluation findings, integrated knowledge management evaluation system, continuous learning about evaluation, and so forth.

Accordingly, organizational capacity envelops teaching and learning strategies and sustainable evaluation practices. Preskill and Boyle posit that four areas of organizational capacity will influence the extent to which individuals will learn and build evaluation capacity and the extent to which it will be sustained. These four areas are: leadership, culture, systems & structures, and communication.

Conclusion

Solving persistent problems requires an understanding of complex system dynamics and systems thinking, which necessitates inclusiveness and multiple perspectives. Those closest to the problem may also have the greatest understanding of it. Preskill and Boyle's model provides a framework that evaluators can use when building the necessary capacity for participatory approaches and truly engaging participants in evaluative and improvement activities. Their model directed my own efforts for building the improvement science capacity of teachers featured in this book's case study. The beginning of Part 2 introduces the case study and explains how their model was at the heart of the study's conceptual framework.

Questions for Discussion

1. What type of system dynamics do you encounter in your own settings or organizations?
2. Why is it important to understand the dynamics of the system before attempting to improve a problem within it?
3. In the case of Newark Public Schools, what could reformers have done differently to more effectively foster change?