

Chapter 17

Creatively Confronting the Adjacent Possible: Educational Leadership and the Fourth Industrial Revolution

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Abstract In this chapter we explore the unknown possibilities that lie in the shadows of disruptions and innovations known as the adjacent possible. We frame the challenges educational leaders face when trying to prepare for an increasingly volatile, uncertain, complex, and ambiguous world that is propelled into the Fourth Industrial Revolution imbued with rapidly changing and unevenly distributed technological proliferation. Throughout our chapter, we offer strategic mindsets in design and futures thinking to combat the growing challenges of preparing educational systems that are rife with existing deep and complexly interwoven wicked problems for uncertainty. We propose that looking to the past, we can discover insights into meta-patterns and the ways we failed to predict the futures that emerged from previous discoveries and innovations. Using this frame, we discuss the potential of combining the interconnected mindsets of futures thinking and design, not to predict the future, but to prepare our educational systems for the uncertainty of the future.

There has never been a time of greater promise, or greater peril – Professor Klaus Schwab (Hutt 2016).

17.1 Introduction

Human beings have a super-power, and that is the ability to make deliberative, long-term decisions. We plan, we strategize, we learn, we create models and stories, all with the goal of understanding the world around us, not just at this moment, but also into the future. But just as Superman has Kryptonite, our super power, our ability to prognosticate has its limitations as well. There are many reasons for this; some have to do with limitations in our cognitive capabilities, some with the kinds of networks and organizations we work within, and some have to do with the complex nature of

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the world itself. What's more, some of these limitations appear as functions or outcomes of the very decisions we make and models we create. These limitations constrain not just us as individuals, they constrain us collectively as well, as we seek to reorient and redesign organizations and systems to address future challenges. Taking our current educational systems as a case in point, we find ourselves challenged to reimagine and redesign these complex socio-technological infrastructures that we have created, to address the challenges of the future. This failure is of particular significance because the main purpose of education (and the key reason why we have educational systems) is to develop the next generation of citizens and leaders, individuals and groups who will live in, and will have to contend with, this emerging future.

The philosopher George Santayana (1910) famously stated, "Those who cannot remember the past are condemned to repeat it." (p. 284). In other words, the "best" way to prepare for the future is to study the past and through that, identify patterns and trends, and then extrapolate them into the future. There is of course a fundamental assumption here—that the patterns of the past will faithfully extend into the future. As we will argue, this assumption, if ever true, is not necessarily applicable in the tumultuous times in which we live. Further, we will argue that questioning this assumption is particularly important for educational leaders, given the future-facing nature of their work. The second decade of the twenty-first century continues to affirm that we are living through an incredibly rapid and volatile time of change, even beyond the global disruption of 2019's severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and ongoing COVID-19 pandemic, which has laid bare the insufficiencies of our political, economic, and cultural institutions. While we paradoxically accept change as a constant of human existence, the pace and scale of the changes we face are wholly unique throughout human history in regard to our present moment. To give our present challenges an order of magnitude, scholars have described them as "planet-sized" (Gidley 2016) and even "intergalactic" (Heller 2018).

Our current collective context has been described as being volatile, uncertain, complex, and ambiguous, popularly acronymized as VUCA (Cousins 2018; Shields 2018). The VUCA frame is used extensively to study leadership and organizational dynamics and strategy across numerous sectors and facets of life (Cousins 2018; Shields 2018). We might think of VUCA as a context or state of affairs, but it also relates closely to a class of problems in the social sciences that have been identified as *wicked problems* (Rittel and Webber 1973). Such problems are characterized by incomplete or even contradictory knowledge, the wide range of people and opinions involved, and the inter-relatedness of these problems with other problems. Wicked problems are also characterized by their indeterminacy, meaning they also can appear without limit or clear forms of closure (Buchanan 1992). Addressing such problems (in fact it has been argued that wicked problems cannot be solved per se but just can be resolved temporarily) do not yield to approaches that attempt to apply existing solutions (Buchanan 1992; Zafeirakopoulos and van der Bijl-Brouwer 2018). It requires us to go beyond moving through a deductive or even an inductive form of analytical, stepwise processes that may have worked for other existing

problems. Working to ameliorate such problems may require reframing them or refreshing our views on them (Fisher 2016; Pacanowsky 1995). In fact, articulating the solution is sometimes the only way to define a wicked problem. Examples of wicked problems confronting us today include financial crises, healthcare, income disparity, poverty, sustainability, and education. Recently, Levin et al. (2012) have identified global climate change as a kind of super wicked problem, where "traditional analytical techniques are ill equipped to identify solutions, even when it is well recognized that actions must take place soon to avoid catastrophic future impacts" (p. 123).

One of the key challenges in contending with wicked problems in this VUCA world we live in is uncertainty. Uncertainty, when defined as a "present state of not knowing, a future oriented inability to confidently predict what will happen in the future and a potential lack of clarity of how to make sense of past events" (Beghetto 2020, p. 1) illustrates the common understanding that feeling uncertain, or facing uncertainty is an unpleasant experience in which we as humans try to resolve or mitigate quickly to return to a more desirable state. Therefore, it is not surprising that understanding how to look for, embrace, and potentially leverage uncertainty is not a mindset or skill that comes naturally to most people. Learning to prepare for uncertainty brings with it an inherent assertion, often incorrect, that leaders or organizations know how to recognize uncertainty and where it comes from. Organizations, are often by their very nature, conservative and somewhat resistant to change. While uncertainty may be uncomfortable at the personal, organizational, or systems level, it can be a powerful catalyst for positive change. Beghetto (2020) suggests that by intentionally designing uncertainty into experiences, we can see uncertainty as a gateway to new possibilities and if we are able to suspend our inclination to quickly resolve or rescind the experience, it can become an opportunity to explore new ways of thinking and action. Later in this chapter we discuss *Futures Thinking* as a design strategy for educational leaders to intentionally engage with uncertainty through developing mindsets that seek out and discover emerging trends of disruption (including megatrends) that are taking place around the globe. Often when dealing with uncertainty, we only look to our own context: the industry we are in, the economic and psychological incentives within our spaces and so on. What is needed is the ability to intentionally cast a wide survey of new and emerging trends, thus providing us opportunities to make connections, and to imagine, and through that, explore and prepare ourselves for possible futures. It challenges us to think about how disruptions in one sector, industry, or geographic region, will impact our organization, our educational systems, our own lives. Embracing this mindset allows us to engage our imagination in thinking of ways to mitigate or leverage new opportunities in the future.

An important factor to understanding our own limitations in accurately predicting and thus preparing for our possible futures, is that we are emotional beings, and as such we ascribe affective states to our thinking. It's hard for us to think about our past (or future), without the corresponding emotional state that memory revives (or one in which we aspire to reach). This is a form of implicit bias, in which a person overestimates the intensity and duration of an affect based on their predictions of

their emotional responses to a future event. This bias when employed to predict a person's future state is known as affective forecasting. Wilson and Gilbert (2003) discuss the role of impact bias in affective forecasting in which people overestimate the emotional impact of future events (positively or negatively). We are all susceptible to impact biases when it comes to imagining the future, especially our own future. Even now, as we turn our attention to the massive disruption brought on by the COVID-19 global pandemic, as we try and imagine our "new normal" in a post-pandemic world we cannot escape the emotional states we've experienced as a result in the shift in our behavior to adapt to the new routines required by the global response to the pandemic. Hammond (2020) provides an example of this bias at work in our everyday lives by proposing that we consider the future of our first train ride (or flight) or even first day back in the office after the COVID-19 pandemic is over, it is likely that we will use our most recent history to predict how we will feel about that moment. It is this impact bias that is subtly pushing our predictive thoughts to the forefront using our most recent (and potentially most heightened emotional experience) as the predictor of how we will feel although we may have taken hundreds of train rides before, or worked in the office for years, it is the most recent experience that drives our ability to predict the future. In the domain of education, this emotional response is often connected to a sense of familiarity with existing educational structures and experiences. "I went through the existing educational system and I turned out ok" is a sentiment often heard when people seek to bring transformative changes to education. This is an emotional response, connected to a sense of the familiar and distrust of change.

While we as humans may be bad at predicting our own futures, and our collective lives full of wicked problems stemming from an accelerating volatile, uncertain, complex, and ambiguous world—all hope is not lost. There is great value in our experiences with uncertainty. For it is uncertainty that becomes the shadows of the disruptions and innovations that propel our societies forward. And it is within these shadows, where the adjacent futures lie, a product of the unintended or unforeseen possibilities made possible with the arrival of a seemingly unconnected advancement or occurrence in our world. Learning to understand the multitude of explored and yet-to-be imagined ways these events will shape our futures, we can open our minds to the creative and imaginative process of exploring not just what may be—but what could be. While it might seem counterintuitive at first to discuss the benefits of uncertainty, throughout this chapter we explore the potential and the exciting possibilities that can immerse from the relationship between uncertainty and creativity. By viewing this relationship through a lens of the possible as a form of inquiry (Glaveanu 2018), the conditions combining our cognitive processes on determining the differences between the possible and the actual, and the sociocultural position of the possible (that exist outside of the individual) present an opportunity to leverage multiple perspectives that allow for (or even create) a space for novelty, creativity, and action. When thinking of "the possible" we often think forward in time (relating to the "possible future") but this is only just one instantiation of "the possible", that may coexist cognitively alongside possible worlds, pasts, and even possible selves. For us to leverage the creativity that is born of the possible, we must explore the

multitude of perspectives that are at play within any system. Glaveanu (2018) argues that to experience the possible (in all its forms) "one needs to become aware of the differences in perspective and of the fact that we all live, as human beings, in a perspectival world" (p. 527). It is from these lessons, that we can learn to stretch our understanding of "what might be" as we consider the rapidly approaching epoch of technological innovations on the horizon within the Fourth Industrial Revolution, and how educational leaders can prepare for the uncertainty this era will bring. This requires leveraging an imaginative design process and futures thinking mindset. Finally, it is important that as we turn our attention towards preparing for the future, we look to our past to learn how groundbreaking innovations paved the way for other advancements and innovations that we never could have imaged possible.

17.2 Looking Back, to Look Forward (Through a Lens Darkly)

There are two ways of looking back at the past, to understand and prepare for the future. The first, as we have written above, is to identify patterns and trends in the past and present and to simplistically extrapolate them into the future. This may work in certain stable contexts but is less reliable as a strategy in the VUCA contexts we live in today. The other approach, more diffident in its projections, but maybe more appropriate given the inherent uncertainty in VUCA contexts is to identify *meta-patterns*, and ways in which we would have failed to predict the futures that emerged. This is, what we call, an acceptance and exploration of the adjacent possible. There is humility in this approach, suggesting that it is more important to accept uncertainty and to be prepared for its disruptive nature. As Robert Burns wrote, "The best-laid schemes of mice and men, go oft awry" (Burns et al. 1991, p. 228) and recognizing that, and building off from it may be the way to go.

As a global society, we have undergone three industrial revolutions that have led the collective human race through the transition of handmade goods to manufacturing, steam power to electricity, microprocessors to cloud computing, brought to fruition the globalization of people and ideas, and ushered the human race into the information age. Each industrial era brought with it new innovations which led to shifts in the economic capability, society, and the movement of people and ideas. Grasping the extent and scope of these changes is challenging, particularly as we look to what has been described as the approaching Fourth Industrial Revolution (4IR). In this context it may be useful, as an intellectual exercise, to step back and look at the impact of *one* technology and how it has played out across time. It will demonstrate, that even in this narrower, truncated context, just how difficult it is to predict the kinds of impact a new technology, as it plays out over time, can and will have on our lives. As computer scientist Roy Amara said, (in a quote often mis-attributed to range of other people, including, but not limited to, Peter Drucker and Bill Gates), "we overestimate the impact of technology in the short-term and

underestimate the effect in the long run" (Ratcliffe 2016). In other words, the effects of particular technologies on cognition, knowledge, and society at large often are subtle and complexly woven (Salomon 1979). Cause-effect relationships are difficult to tease out. Moreover, these effects often are not immediately appreciated, but rather, show their influence on far longer time scales—decades or maybe even centuries.

For instance, consider the invention of the printing press—arguably one of the most significant technological advances of human cultural evolution. It allowed for mass literacy, and in some ways, it can be argued that, our educational system is built around the "book." The "book" and the ability it provided to inscribe and share ideas in a concrete form is what led to the renaissance, the reformation, the scientific revolution. By democratizing access to information and knowledge, the book, challenged authority, and popularized ideas such as "all men [*sic*] are created equal," or "man [*sic*] is born free, but he is everywhere in chains" leading to transformative social change, the impact of which we feel even today.

But the impact of print technologies is more complex and greater reaching than even that—in ways big and small. One of the unintended consequences of the invention of printing was that many people realized they had poor eyesight. That had not previously been an issue because masses of people had not needed to peer at small print on a page by candlelight. Within decades after the invention of the printing press, lens makers were making spectacles and it became a booming business across Europe. A side effect of this growth of interest in glass and its refractory properties led innovators to play and experiment with them and discover new and alternative uses for lenses. And it was that undirected play, with pieces of polished glass, that led to the invention of the microscope and the telescope. With those new innovations, suddenly the infinities of the very small and the very large became revealed to us and transformed how we looked at the world and our place in it.

Furthermore, scholars of technology have argued that the influence of media can manifest itself in even more subtle ways. For instance, it has been argued that the impact of media can be best understood in the manner in which different media *prefigure* processes and structures (cognitive and social) in different ways. And it this *prefiguration* that led to the dramatic changes in all aspects of social, cultural, political and social life in Europe and, in ever expanding circles, across the world (Bolter 1990; Eisenstein 1980; McLuhan 1962, 1964; Ong 1982; Provenzo 1986). This argument is based on the idea that, as Mishra et al. (1996) write:

Most of the significant effects of the invention and spread of print can be traced to certain specific properties of print media: In particular, print created objects that were *mobile, immutable, presentable, and readable*; and these properties led to fundamental changes in human cognition (Latour, 1990). These properties ensure (or seemed to ensure) that discussions could be carried beyond the conversational arena, that ideas could be transported without change in their essential nature, and that they could be universally and consistently understood (at least by those who knew the conventions) in a way that more mutable, "unreliable" oral re-tellings could not. The crucial argument here is that initially it was the medium, this new fixed object, that was immutable. Then the idea of immutability passed on from the medium to the message, with attendant implications of accuracy, fixedness, and truthfulness. (p. 289).

A few of the consequences of this transference of properties from the medium to the message were that it solidified the notion of ownership of ideas and the convention that arguments could be settled by invoking the appropriate text, that ideas could be "owned" and more. This is of course in sharp contrast to an oral culture, where meanings were deeply connected to speech, with no external arbitrator or authority. This idea, that the impact of a new technology or medium goes beyond the content being distributed is best captured by McLuhan's pithy quote: "the medium is the message." According to McLuhan (1964) "the 'message' of any medium or technology is the change of scale or pace or pattern that it introduces into human affairs" (p. 1). For any technology, the potential "message" it brings may have enormous impact on human affairs, even if the original intended content of that medium may only have a limited, or narrow scope of impact. McLuhan illustrates this potential (in an intentionally exaggerated claim) that when considering the power of the "message" that is brought with the advent of electric light, he argues that brain surgery and night baseball are both examples of the "content" of that electric light, and without the advent of the electric light, neither example would be possible (McLuhan 1964, p. 2). It is this deeper exploration of the power of an innovation or disruption that brings with it the inherent uncertainty of what else may be possible. What future possibility lies in the shadows of a new invention waiting to be discovered, what adjacent future is hiding in plain sight?

The advent of the Internet, and most importantly of social media, is another example of this phenomenon. In many ways social media is more akin to an oral culture than one solely based on print. We can see the relative unraveling of the ways of thinking and being that were based on a print culture as we move into a social media dominated world. We are confronting the consequences of this shift in technology at that very moment across the world. The key question of course, is what impact this will have on us in the long run, and what we can predict about the uncertainty it will bring? If anything, the complex history of print and the inherent 'uncertainty of its evolution and impact nudges us towards humility. This uncertainty, of course, does not mean that we don't prepare for the future, rather that we ought to do it without arrogance and by eschewing simplistic, cause-effect relationships.

This extended digression of the impact of information technologies— not just on society but on the very way we think and act in the world is what we call the *adjacent possible*. Author Steven Johnson (2014) borrowed the idea of the adjacent possible from theoretical biologist Stuart Kaufmann, and gave the construct that we build on in this chapter. Johnson (2010) writes:

The adjacent possible is a kind of shadow future, hovering on the edges of the present state of things, a map of all the ways in which the present can reinvent itself... What the adjacent possible tells us is that at any moment the world is capable of extraordinary change, but only certain changes can happen. (p. 31).

An interesting difference to note about adjacent possibilities compared to longer more future-oriented possibilities, is that while a future oriented possibility may require a very specific occurrence of many interconnected stepwise possibilities to transpire, adjacent possibilities are the literal "ready-at-hand" possibilities for any

current state. Björneborn (2020) defines adjacent possibles as “actual” possibilities that “constitute what actually is possible for a specific entity with specific capabilities in a specific setting at a specific time” (p. 11).

In summary, it is clear that with any new technology, innovation, or disruption, there lies an uncertainty within its shadows that can hold potential benefits, or even harms to human society. Uncertainty is all around us, and is ever present as we peer to the horizon. It is with this knowledge that we turn to thinking about the future, and how to handle the uncertainty it brings. *We think not in terms of predicting the future, but in preparing for it.* In short, we argue that predicting the future is a business best left to charlatans, for the rest of us, we shall work towards preparing for uncertainty. And, that requires a combination of strategy *and* creativity, particularly as we explore the implications of the next epoch of transformative advancements that are coming into reality at this very moment: what has been hailed as the Fourth Industrial Revolution.

17.3 Coming Soon, to a World Near You: The Fourth Industrial Revolution

As a global society, we now find ourselves on the precipice of the Fourth Industrial Revolution (4IR), which the World Economic Forum defines as “a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human” (Schwab n.d.).

To gain some perspective on these claims about the potential impact of the 4IR, it may help to revisit some of the effects (some of which are just beginning to be felt) of the Third Industrial Revolution. This industrial revolution which is sometimes referred to as the “digital” revolution was the era of the twentieth century that brought innovations such as the microprocessor, digital communications, and perhaps most prolific (from a global scale) the Internet. Looking at these innovations, each one of us can trace some element of our modern conveniences and our workflows to the digital transformations made possible by this Third Industrial Revolution. When we start to look more specifically at the system of education, we can draw even more lines of connection between digital innovations and the educational environments and opportunities afforded by those inventions, online learning for example. A now seemingly robust (if not a commodity) learning modality amongst higher education institutions. Access to higher education is another major effect of the collective advancements made in the Third Industrial Revolution. According to Penprase (2018) the population that had access to higher education in the United States rose from a mere 4% in 1900 to almost 70% a century later in 2000. Penprase also argues that through these advancements in digital technologies higher education institutions have been able to reach a more diverse student population that improve the traditional learning experiences through online learning,

videoconferencing, and leveraging the traditional experience by offering hybrid learning environments. These impacts can be seen around the world currently, in the global response to the COVID-19 pandemic. With universities and K-12 school systems moving to fully online, hybrid, or some other combination of in-person and remote learning has enabled the educational process to continue across regions (national or local) where traditional in-person learning experiences are not safe.

As we turn our attention back to the 4IR, we can start to imagine how this new epoch of innovations and disruptions might change the way we think about education and learning. Thinking into the futures about the potential use of mature technologies that are only in their nascent stages of development today such as artificial intelligence (AI), extended reality (XR), nanotechnologies, and smart materials (to name just a few), it can be easy to get excited about the transformational possibilities. In a short essay that reimagines the futures of lifelong learning through an augmented human-cybernetic experience the reader is prompted to visualize the adjacent future of these emerging technologies that allow for a completely redefined learning environment, one that is reminiscent of a distributed-computing model, where the learning no longer takes place in the center (traditional educational model) but at the learner themselves (or the “edge”) made possible by truly intelligent individualized tutoring systems (Leahy n.d.). This imagined future recounts the possibilities afforded to the learner when all spaces (physical) and technologies are aligned to provide the user with the preferred just-in-time learning and experiences, that the individual needs to progress in their personally defined learning goals. However fun and exciting this imagined future can be, we would be remiss if we did not take a moment to secure our feet to a healthy foundation of skepticism. This is not the first time in our history that we have been promised an era of transformational technological innovations that will reshape our educational institutions. In fact, we can point to nearly a century of lofty claims and predictions about the revolutionary changes a new technological innovation would have on education, only to experience weak or ineffectual realizations of the overhyped promise, yet the 4IR claims to be different. Previous examination of emerging technologies shaping the beginning of the 4IR has proposed a futures studies methodology to critically examine and challenge the assumptions of technologically proposed futures and suggests that new emergent pedagogical approaches may be more influential in informing the futures of education than technological advances alone (Leahy et al. 2019).

17.3.1 Three Pressing Challenges

The 4IR brings many lofty claims about the potential for advancement and innovation of converged digital, biological, and virtual systems on the collective human experience. Yet even at present time we cannot ignore that in parts around the world the advantages and impacts of the previous three industrial revolutions have not yet been fully realized. If we consider the futures of the 4IR, and the rapid innovation of technological advancements we must also consider our ability to adequately

adapt our societies and institutions at a macro-level, as well our own norms and behaviors at a micro-level, to handle the powerful new technologies that may be just around the corner, or lurking in the shadows of the adjacent possible of tomorrow. It could be argued today, that as a society, we have not yet been able to control the power of social media or the new found power of big data and predictive analytics we've only just begun to explore in the information age. So how then can we be prepared for the next wave of disruptions that are said to outpace any previous innovations in human history? If we look to the futures of the 4IR, we must consider the challenges it represents alongside the potential for untold advancements in the human condition. In their book, Schwab and Davis (2018) propose three pressing global challenges that we must rise to meet to create a more inclusive and equitable future which we will discuss in turn, along with their implications for our educational systems: fair distribution, externalities of risk, and human-centric approach. Taking each in turn:

Fair distribution: Historically, the benefits of all three previous industrial revolutions, have not been equally and fairly distributed. In fact, it is clear that they still are not equally distributed even today. As inequities rise around the globe, the wealthiest portions of the population continue to reap the economic benefits of new innovations and advancements in access, wealth, and healthcare. This challenge, when viewed through the educational system, is all the more pressing. The educational system is no stranger to inequities of access, in fact this is still a major issue across the U.S. (and the world) at all levels. This of course raises the question of how we can prepare for the uncertainties that will arise with the onslaught of faster technological innovations, disruptions, and convergences? Schwab and Davis (2018) point out that this issue of fair distribution is far more than a moral or ethical challenge, but one that may have far reaching consequences. They write that, "the failure of many democratic systems to address disparities in wealth or opportunity stemming from their prevailing ecological models has led to entrenched social and economic imbalances that are both divisive and destabilizing" (p. 52). These ideas lead us to also consider the adjacent futures, such as what will happen to the world economic labor force when these promised advances in technology replace the human workforce. What happens to a society where the labor force is reduced or replaced by automation or AI? What does the educational system look like if there are fewer economic opportunities to prepare for? It is in this context that ideas such as Universal Basic Income (UBI) have been raised though it has mixed support. Proponents argue it that UBI will stabilize and ensure a healthy citizenry to the critics who argue it proves a disincentive to work (Parolin and Siöland 2019). All of these have significant educational implications.

Externalities of risk: Schwab and Davis (2018) argue that in the past not enough effort was devoted to protect "vulnerable populations, the natural environment and future generations from suffering as a result of unintended consequences, costs of change, second-order impacts or deliberate misuse of new capabilities" (p. 13). Looking at this challenge from the lens of educational systems, we can begin to start asking questions that can help us, not to predict what the future will hold, but help us build resiliency and adaptability into our systems to handle uncertainty. To

combat this second challenge, this would be an appropriate space for educational institutions to engage in futures thinking and strategic foresight. Looking to the emergent megatrends and preparing strategic plans to mitigate possible, or plausible unintended consequences, and try to find opportunities within the uncertainty.

Human-centric approach: Due to the increasingly technological advancements and the convergence of industries and big data notions such as privacy and agency may become threatened or coerced at a level we have only begun to imagine. Schwab and Davis (2018) warn of the potential threats if we do not ensure a human-centered approach to new technology; "They can assess and make decisions based on data that no human can process, and in ways no human understands" (p. 14). This challenge calls for renewed efforts of educational leaders to engage in humanistic approaches to systems change.

17.4 Imagining Educational Leadership for a VUCA World

We have so far offered a range of ideas accounting for our current situation/context, as well as the impact that global trends, particularly technological trends, have made or are poised to make for our systems of education. We have also charted the inefficacy of rationalist, top-down planning that comes from most dominant educational leadership paradigms. As we begin to weave the narrative for how we move from challenge to solution, we can see the picture emerge with an emphasis on the adjacent possible and the important role of imagination.

What the foregoing suggests is our VUCA world, imbued as it is with its wicked problems, and emergent 4IR transformations presents tremendous challenges for educational leaders. While most education in the United States and even across the globe tends to be operated and managed at a local level, many of the existing problems and challenges are universal: the effects and complications that poverty has on students, systemic goals and bureaucratic mandates emphasizing increasing performance (and delivered with increasing punitive outcomes in the name of accountability) on standardized tests, and the ravages of inequality perpetuated by cultural and, particularly in the United States, racial discrimination. These challenges may be considered wicked in their own right, and have been nagging and pervasive sources of complication in education for decades. However, the rapid technological transformation and global interconnectedness of the 4IR brings yet another host of challenges, many of which are not predictable, and whose impact we cannot yet begin to perceive.

Thus, given the shifting demands on schools, from accountability and testing reforms to the increased demands for social services that schools must provide, leaders have plenty of wicked problems to contend with. Moreover, these problems do not exist in isolation from one another, they are deeply and complexly interwoven. It is also clear that this form of systems thinking, or learning (at a meta-level) from the past and understanding underlying transformational trends is not something that has entered the educational vernacular. It is at some level a failure of the

imagination—something bureaucracies are not particularly situated to do well. In fact, this failure of the imagination was pointed to by the 9/11 Commission report as being part of the failure to prevent the attacks on the World Trade Center. The report offers that “imagination is not a gift usually associated with bureaucracies” (National Commission on Terrorist Attacks upon the United States 2004, p. 344), but that imagination as a tool for leadership must be developed and engaged routinely, perhaps even as a function of a bureaucracy. Organizational theorist Karl Weick (2005) explored this concept further, going so far as to suggest that solutions to such failures of imagination might require replacing traditional emphases on deductive reasoning with abductive reasoning, and focusing organizational design activities on sensemaking rather than only decision making. In one subsequent military analysis, Hoover (2013) even made a connection to this lack of imagination as consequence of the failures of the American educational system itself, noting that, “the dearth of imaginative thinking which is a consequence of the educational system is increasingly critical in the current world economic environment where tried and true solutions are falling short” (p. 62).

It is clear, however, that leading our complex education systems toward a place of efficacy and sustainability through the Fourth Industrial Revolution and other changes will not happen as a matter of linear sequencing or planning where all of the requirements and outcomes of change initiatives can be easily predicted and executed. Furthermore, these issues are complicated by the fact that many education systems are still enduring and mitigating the uneven instantiations of the prior industrial revolutions let alone prepared for the fourth. Perhaps articulated another way, leading change in our complex educational systems will require navigating intensely sticky and historically-laden systems that are already and always ongoing, in a VUCA world.

While the turbulence of this VUCA world and its associated wicked problems create difficulties for solving problems in traditional ways, it is not wholly without promise for educational leadership. Times of crisis transition have created opportunities to reimagine possibilities and to explore ways to solve those problems that have not yet been solved (Cook 2019; Fullan 2007; Heifetz 1994). In educational leadership, several existing theories have offered pathways to lead through the kind of uncertainties we face now and will likely face in the future. For instance, Fullan (2007) provides a framework for leading in a culture of change, in which he emphasizes leading people to ameliorate challenges that have not yet been solved. This has close connections to the work of Heifetz’s (1994), Heifetz et al. (2009) work on adaptive leadership theory, which suggests that leading through the adaptive changes of a VUCA world requires new knowledge and modes of operation, including the paradigms and perspectives leaders themselves bring to the challenge (Heifetz and Linsky 2002).

In some sense then, given the difficulty of both untangling the complexities of a given problem and the contingent nature of the untanglings that arise, educational leaders are beginning to look beyond traditional leadership models and strategic planning methods to address these kinds of challenges. Indeed, we might see this VUCA context as more than an occasion to castigate the inefficacies of our current

leadership practices in education, but as an opportunity to use the adjacent possible as a way to explore what could be. And while our educational systems are currently mired in complexity and carry a legacy of stickiness and resistance to change it is worth recognizing that our educational systems have themselves been *designed*. As Richter and Allert (2017) wrote:

Education and educational systems are artificial phenomena in the sense that they emanate from human intervention and effort. Irrespective of whether we look at policies, curricula, instructional measures, tools, networks, or environments, educational processes are essentially shaped by man-made inventions and artifacts. As a consequence educational processes are not uniform and lasting but contingent on the socio-material, and historical conditions in which they take place. (p. 1).

And it is recognizing the artificial and designed nature of all education that can be a starting point for redesigning the futures of education, grounded a clear-eyed acceptance of ambiguity, a knowledge of history and of current technological and global trends combined with a sense of humility. Thus, the task is to take designing as a point of departure, thereby allowing educational leaders to the imaginative and creative work of the adjacent possible, and to embrace the interconnectedness of uncertainty and creativity.

17.5 One Possible Solution: Futures Thinking

To help accomplish this, we can turn to some of the tools used in futures thinking and strategic foresight as frameworks for preparing for the future. Futures thinking is generally described as an intentional practice of thinking about the future in a structured way, guided by a range of methodologies and frameworks designed to guide the process (Prosser and Basra 2019). In addition, futures thinking can be described as a mindset or philosophy focused on the act of evaluating emerging global trends and informing strategic plans to handle future uncertainty. It is important to note that futures thinking is *not* about trying to predict the future, but rather prepare a system or organization for uncertainty.

Futures thinking embraces the emergence of new disruptions (natural or human-created) and recognizes, what the Copenhagen Institute for Futures Studies (CIFS) describes as megatrends. Megatrends, in this context, are major global areas of development that have a lifespan of 10–15 years, in which there may not be any expectation of linear development within the trend category. CIFS has identified and published a list of 14 megatrends namely: technological development, knowledge society, acceleration and complexity, polarization, individualization, immaterialism, network society, demographic development, economic growth, globalization, sustainability, focus on health, commercialization, and democratization (Copenhagen Institute for Futures Studies 2020). It is clearly untenable, given the length of this list, to become an expert or perhaps even well-versed in all of these topics. However, as we engage in thinking about our own futures, this list provides us with a “first stop” of the types of disruptions that might be happening around the world, allowing

us to ask critical questions as we think about our own preparedness for uncertainty. Thus, recognizing these megatrends as sources of uncertainty, means that we can start to ask probing questions about these disruptions use these questions as a way of interrogating our preparedness to deal with this uncertainty. This allows us also to look reflexively on our own organizations or professional contexts to gauge our collective readiness to handle the uncertainties that will come. For example, considering one of the megatrends, that of acceleration and complexity, leads to a range of questions of relevance to education. For instance, one may ask how shortened business lifespans and the increasing convergence of industries impact education? Or, alternatively we may seek to ask how the presence of algorithmic bias in artificial intelligence and facial recognition systems may further exacerbate pre-existing social, racial, and economic inequities. Again, the idea is not to pretend to predict the future, but to recognize emerging global trends and strategically prepare our organizations for potential disruptions, as well as possibly identify new opportunities.

17.5.1 Futures Thinking in Practice

To illustrate the potential benefits of the practical implementation of futures thinking and strategic foresight tools, we will explore a hypothetical example of how this can be applied in the context of educational leadership. For our hypothetical case, let's consider a leadership team from a K12 school district that consists of the superintendent, school board members, executive cabinet (or council), and a selected team of invited principals and staff from the district. This team, for the sake of this example, is working to create a three-to-five-year strategic plan to support equitable student achievement for all students across their district in the wake of the COVID-19 disruption of 2020–2021. This hypothetical team, like so many real educational leadership teams may be full of members that are familiar with organizational development and leadership approaches to various forms of strategic planning that include strategic thinking and management (Fullan 2007; Heckelman 2017; Kaplan and Norton 2001; Meehan and Jonker 2017). However, in this hypothesized case, the team wants to expand their thinking beyond the immediate, by intentionally working through possible futures in a structured method to better design an agile and adaptable district system. Enter futures thinking and strategic foresight. This hypothetical case also serves to illustrate the additive nature of futures thinking, and the role of strategic foresight tools by the adoption of the intentionality in which leadership teams can incorporate these tools and frameworks into their existing organizational planning methodologies. It does not require leadership teams to abandon their existing structures and processes, but rather provides a structure to explore their planning in ways that prepare for the uncertainty of the future.

While there is no prescriptive toolset or strict methodology that a team such as our hypothetical K12 leadership team *must* follow in order to successfully engage in futures thinking, there are lots of freely available foresight tools that can provide the

structure for teams to engage with the discussions and often difficult conversations that arise when challenging a set of ideas and strategic plans against the unknown. In this example, we will operate under the assumption that one (or more) of our team members have taken the lead to incorporate a foresight tool in their strategic planning meetings. As they begin thinking about the future, and possible disruptions that might emerge as stated in the aforementioned megatrends of innovation, the planning team examines the emerging trends identified as having the potential to impact or disrupt the education sector, and the possible disruptions that may impact their local economy as well, knowing these disruptions could have direct impact on their district communities. It is at this point in their planning that a foresight tool can provide a central focal point for discussion and deeper examination of their strategic plans, mapped against the list of possible disruptions. One of the challenges when engaging in strategic foresight is to visualize or otherwise map out the often hard to conceptualize “possible” disruptions.

To facilitate this next phase of their strategic planning, the member (or members) of the team that are leading the foresight work could introduce a tool generically referred to as a “cone of time” that is meant to provide leaders a way to think about time in multiple, simultaneous timelines. The Future Today Institute (n.d.) provides one such tool as one of eleven open source (licensed under Creative Commons) foresight tools that are freely available to use and build upon. The “cone of time” version from the Future Today Institute (FTI) known as a “strategic time horizon” is represented as a horizontal cone, with the closed end of the cone on the left-hand side, representing the most near-term timeframe (tactical) of one-to-two years. As the cone widens towards the righthand, it is further broken into subsequent timeframes of three-to-five years (strategy), five-to-ten (vision), and 10+ years (systems-level). As the cone widens with more distant timeframes, it represents the increased uncertainty facing the organization. For example, the uncertainty for the tactical timeframe of one-to-two years is typically less than the uncertainty at the systems-level timeframe of more than ten years. One of the key elements of this tool is to help leaders think about the spectrum of time in relation to the possible disruptions they have identified and how their organization can respond to those uncertainties.

Returning to our hypothetical team, after discussing the identified trends and mapping them according to their sense of relevance and urgency for the district, the team then employs the “cone of time” to explore the future time horizon as a *cone* of expanding uncertainties, rather than a singular, linear *path*. As the leaders discuss emerging trends, they spend time mapping several of the most prominent trends at various points in the space of the time cone and discussing the implications for the district and surrounding community should these trends come to fruition. As they plan, they begin to center in on the emergence of artificial intelligence and learning analytics, and discuss how they should best consider the proliferation of learning analytics with their equity aspirations. They ask: as more and more of our teaching and learning platforms become imbued with predictive analytics, how will we ensure that our technology partners and vendors are similarly committed to issues of equity and inclusion as we are? As a result, the planning team makes a

recommendation to refresh their vendor management strategy to annually revisit their contracts and policies to ensure alignment with their vision.

To conclude this hypothetical situation, our imagined leadership team was able to successfully define a strategic plan to address their goal of increasing equity in the district by surfacing relevant disruptions and working through the potential impact of the disruption on their plans. A key takeaway, with this illustration, is again, the emphasis that this and other foresight tools are not intended to try and predict the future, but to provide an intentionality to address future uncertainty. Using a futures thinking mindset and strategic foresight tools provide leadership teams with the ability to plot known and hypothetical disruptions and discuss how possible eventualities of uncertainty can provide risk, opportunity, or growth to their organization and system.

17.6 Summary

Through this chapter, we have worked to demonstrate that while human beings contend with volatility, uncertainty, complexity, and ambiguity – as well as rapidly changing and unevenly distributed technological proliferation – we have creative and imaginative capabilities that enable us to pursue ambitious and necessary work. In the domain of education, leaders face a host of VUCA contingencies, including the challenge to innovate and redesign intractable, historically-laden systems. While the tools and methods of futures studies do not guarantee sweeping reforms and redesigns, we do believe they offer promise for supporting new ways of thinking and leading that meet the needs of the adaptive challenges education leaders face.

Embracing the adjacent possible through a combination of design and futures thinking is how we, as humans, can try to mitigate the effects of our own Kryptonite, by addressing head-on the limitations of our own ability to prognosticate. While learning futures methodologies and those of design may not inherently appear to be synergistic, we would argue that both of these approaches to preparing organizations and systems for uncertainty are interdependent. Each approach has its own set of internal mechanisms, methodologies, and skillsets, yet they share a mutual approach to uncertainty. Futures thinking and design both demonstrate a clear-eyed acceptance of uncertainty. It is the uncertainty, and the adjacent possibilities that lie within the shadows of uncertainty, that both approaches draw their optimistic mindset. This similarity is what prepares us to be resilient in the face of uncertainty, to embrace it, and design and build systems to intentionally withstand the only constant we can predict, change.

These tools, when coupled with the imaginative and creative mindsets of the adjacent possible, create necessary but likely insufficient capabilities for educational leaders who stand poised to become much more than bureaucrats, middle managers, or stewards of the status quo. Just as Santayana's adage offers a prophetic warning about the past, we hope that leaders may come to utilize the mindsets and methods of the adjacent possible in designing successful narratives of the future.

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Chapter 18

Learning in An Uncertain World: Transforming Higher Education for the Anthropocene

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Abstract As the Fourth Industrial Revolution rapidly changes how people live, work, and connect, and as the realities of the Anthropocene and a planet irrevocably marked by human activity come to impact all aspects of existence on Earth, our species faces great uncertainty. Social, economic, and environmental challenges, primarily of our own doing, pose grave risks with no certainties as to their resolution. In a world awash with rapid transformation, higher education has not kept pace with emergent needs. In order that higher education may help us survive, it must undergo evolution and transformation to suit the uncertainty of the Anthropocene. This chapter offers several preliminary recommendations for this endeavour. The higher education of tomorrow should be more flexible, creative, focused on critical skills, leverage constructivist pedagogical tactics, and be supported by earlier education that can help prepare students for a transformed higher education and the challenges of this epoch.

18.1 Learning in an Uncertain World

The human capacity for complex cognition, reason, metacognition, and creative ideation has led to the genesis of innovations that have transformed the way our species experiences and navigates life on Earth. Art, science, medicine, engineering, and the host of other products of the human mind, have been pivotal to our success. One of the most formidable innovations in the story of our species is the transition from informal transmission of knowledge to the development of formalized education, with higher education in particular representing the pinnacle of knowledge and

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