Chapter 1: A New Paradigm of Leadership

"To arrive at the truth, once in your life you have to rid yourself of all the opinions that you have received, and reconstruct anew, from the foundation, all the systems of your knowledge."

-- René Descartes

With brows knit and head cocked slightly, he rubs his forehead back and forth, furiously weighing his options, a black stone held between his fingers. Just a couple of days ago, the reigning world champion told the press he would win in a landslide victory, but now it seems that his opponent is much stronger than he thought. At stake is not just a $1,000,000 prize, but the primacy of human intelligence. His opponent never has to take a break during the five-hour match, and never gets tired, hungry, or swayed by emotion.

"Oh, wow!" the crowd exclaims in disbelief, as he grimly places a white stone on the board to signal his resignation.

Over 200 million people around the world watched this historic match, which was streamed live from South Korea in March 2016. The five-day match between Korean Lee Sedol, the legendary world champion of the ancient Chinese board game of Go, and AlphaGo, an artificial intelligence (AI) developed by Google's DeepMind, was over.[1] Lee Sedol lost the five-game match 1 to 4 to AlphaGo.

Go game: Wiki commons

Go is a 2,500-year-old Chinese board game played by 40 million people daily. Players take turns placing black or white stones on a board, trying to maximize territory. Go has long been viewed as the most challenging of classic games for artificial intelligence because of its enormous search space and the difficulty of evaluating board positions and moves.[2] The average

number of possible moves for a given turn in Go is 250 (in chess, it's 35). The number of possible board configurations is 10^{170}, many more than the number of atoms in the universe. A typical Go game lasts 150 moves, often taking over five hours (no wonder my mom threw out my dad's Go stones!). Intuition—the ability to judge the game from the overall picture of the board—is essential to win. It's a result of lifelong learning and experience in the game. These factors make brute-force search impractical (brute-force search is how IBM's Deep Blue won a chess match against Garry Kasparov in 1997).

How did AI achieve this seemingly impossible feat 10 years faster than industry sages (such as Elon Musk) anticipated? You may be surprised to learn it's the exact same method Google, and many other Silicon Valley tech companies, use for managing people. This method is based on how complexity is created in the business environment—the very force that makes doing business today challenging. Harnessing the principles of complexity can transform old economy-based companies into ones fit for the competition created by the tsunami of digital revolution. It can also dramatically improve the capacity for innovation all companies need to successfully compete.

That is what this book is about: it will teach you how to harness complexity and jumpstart radical innovation that redefines industry dynamics. It will reveal how to use complexity to your advantage, instead of becoming paralyzed by or irrelevant because of it. It will teach you the concepts and tools necessary to adopt and exploit positive complexity, stimulating radical innovation with your products and services. Every company and every leader can benefit from applying the leadership principles in this book.

Principles of companies (and AI) who win

Self-organizing agents

AlphaGo and Google both use self-organizing agents. In AI, agents are nodes where computation happens, similar to individual neurons in our brain. The agents learn everything themselves, instead of relying on pre-programmed instructions. This is different from IBM's Deep Blue, which was given expert instructions from chess grandmasters on how to play the game.

Google's stance on this principle is seen in how it manages people: "Hire the best people and get out of their way."[3] Google allows people to self-organize. At Google, managers are encouraged to delegate as much as possible, to the point where they start feeling slightly uncomfortable.[4] It is also evident in its 20%-time policy, where employees spend 20% of their time working on what *they* think will most benefit Google. This freedom empowers them to be more innovative; some wildly successful projects have come from this policy, such as the multi-billion-dollar AdSense business.[5]

Using simple rules

AlphaGo uses simple rules to consider each move. One group of rules, called policy networks, evaluates positions and reduces the breadth of search, and another set of rules, called value networks, predicts the probability of winning in a given position and reduces the depth of search. Using these rules increases the speed of computation by reducing the input AlphaGo needs to process. Human brains do the same thing; we use mental models to process the same input more quickly next time.

Google, too, uses simple rules as loose guidelines for a diverse population of self-organizing employees. Without these simple rules, tens of thousands of employees' self-organization would result in chaos, with no consistency in direction. Google's simple rule to decide when to add a layer under a manager: have a minimum of seven employees.[6] What about office space? Keep it open to maximize interaction. Ethics? "Don't be evil." How to allocate corporate funds? Spend 70% on existing products, 20% on emerging products, and 10% on moon-shot projects. These simple rules not only provide loose parameters by which employees can self-organize, but also speed up decision making, another essential criterion for innovation. Another important role of simple rules is to serve as a mechanism to create a higher level of complexity, which will be discussed in much more in depth later.

General intelligence vs. narrow intelligence

Unlike a narrow AI, which is used for very specific purposes, AlphaGo is an artificial general intelligence (AGI)—a single system that can operate on a wide range of tasks. The problem with narrow AI, such as those used in smart homes, is that it breaks when faced

with unexpected situations outside of hand-crafted, pre-programmed solutions. General-purpose algorithms like AlphaGo's, are much more resilient and adaptive.

Jonathan Rosenberg, former Google SVP of products, and Eric Schmidt, Executive Chairman of Google, explain how they see the generalist versus specialist quandary.[7]

> Favoring specialization over intelligence is wrong, especially in high tech. The world is changing so fast across every industry and endeavor. Hiring a specialist in such a dynamic environment can backfire. A specialist brings an inherent bias to solving problems that spawns from the very expertise that is his punitive advantage and may be threatened by a new type of solution that requires a new expertise. A generalist doesn't have a bias and is free to survey a wide range of solutions and gravitate to the best one.[8]

Diversity of input

Diversity of input improves AlphaGo's performance. AlphaGo developers trained AlphaGo with 100,000 games played by decent amateurs, where it learned to predict what the next move would be. Then it played against itself 30 million times, learning each time. Research has shown that the collective wisdom of many ordinary people is more accurate than one expert's opinion.[9]

> Google leaders Schmidt and Rosenberg agree.[10]
>
> Homogeneity in an organization breeds failure. A multiplicity of viewpoints, aka diversity, is your best defense against myopia. People from different backgrounds see the world differently. These differences of perspective generate insights that can't be taught. When you bring these together in a work environment, they integrate to create a broader perspective that is priceless.

Google has devised many processes to increase diversity of input, such as making hiring and promoting decisions by a minimum committee of five people. The hiring webpage states, "At Google, we don't just accept difference—we celebrate it, we support it, and we thrive on it."[11] From this vantage point, diversity is not a compliance issue—it is a strategic issue.

Lots of trial and error

AlphaGo learns by many repeated experiments: trial and error. Rather than brute force calculation, it uses reinforced learning: it interacts with the environment and learns

in the process. Trial and error results are weighted to either amplify or dampen the input, thereby incrementally improving the algorithm. This is similar to how stimuli fire neurons in our brain. Many losses were necessary in order for AlphaGo to slowly improve its win rate. Failures are a necessary input to improvement.

Google runs thousands of rapid experiments, measures the results, and repeats the process for incremental improvement. The inevitable failures during the process aren't punished. Schmidt spoke on the failure of Google Wave, a real-time communication platform. "Our policy is we try things. We celebrate our failures. This is a company where it is absolutely OK to try something that is very hard, have it not be successful, take the learning and apply it to something new."[12] Success comes from learning, which comes from failures—success requires failures. Often radical innovation that introduces a new product category or reshapes the dynamics of an industry is an unpredictable side effect of this experimentation process (think 3M's Post-it notes).

These principles, which helped AlphaGo beat Lee Sedol, are the same principles that help Google—indeed, any organization—create a culture that can serve as a primordial soup to spawn radical innovation. These are examples of how Google is creating positive complexity. These principles are universally applicable to all organizations because they are based on laws of nature, including how our brain works.

Responding to the complexity of today's business environment

In the past, our model of success in business started with a strong charismatic leader with superior intelligence who could see through the end of the game, pick the best solution, and hand out orders to employees, who then executed them with specialized division of labor in functional silos. This is similar to how an AI with a brute-force approach could win a chess game that is not as complex. It can simulate all possible scenarios from each move and make a move based on the highest probability of winning.

The increasing complexity of today's business world makes that model obsolete.

Just as AI had to be upgraded from the brute-force approach to a speedier and more flexible approach to win a complex game like Go, so leaders must up their game to successfully navigate today's complex business environment. Even the best AI can't direct

current moves based on the expert knowledge that sees through the end of a Go game from each move. The game has become too complex now.

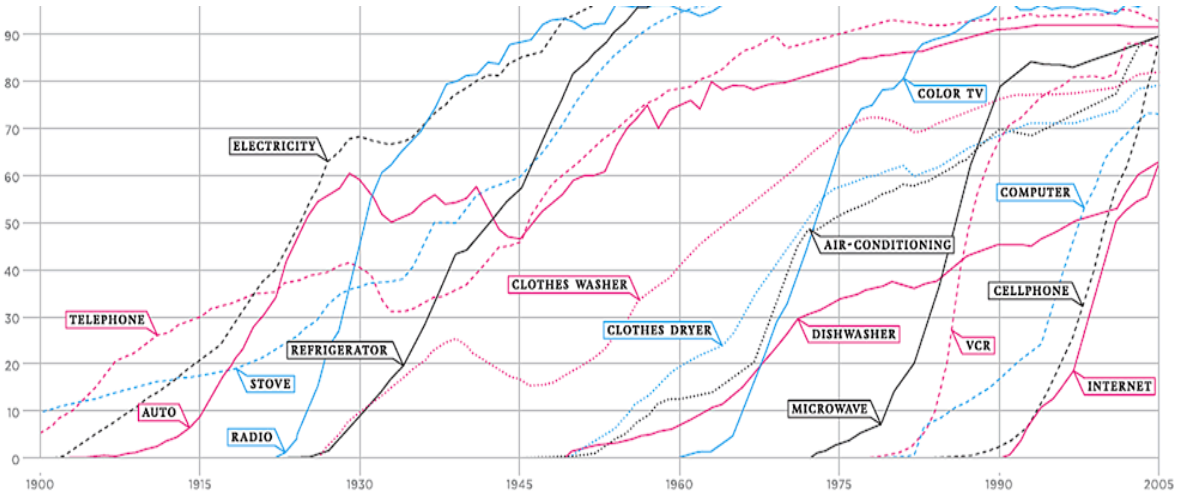
Four factors have dramatically increased the level of complexity today:

- The increased number of new variables introduced
- The increased speed of interaction among those variables
- The increased density of population and resulting density of interactions
- The degree of interdependence among all variables involved.

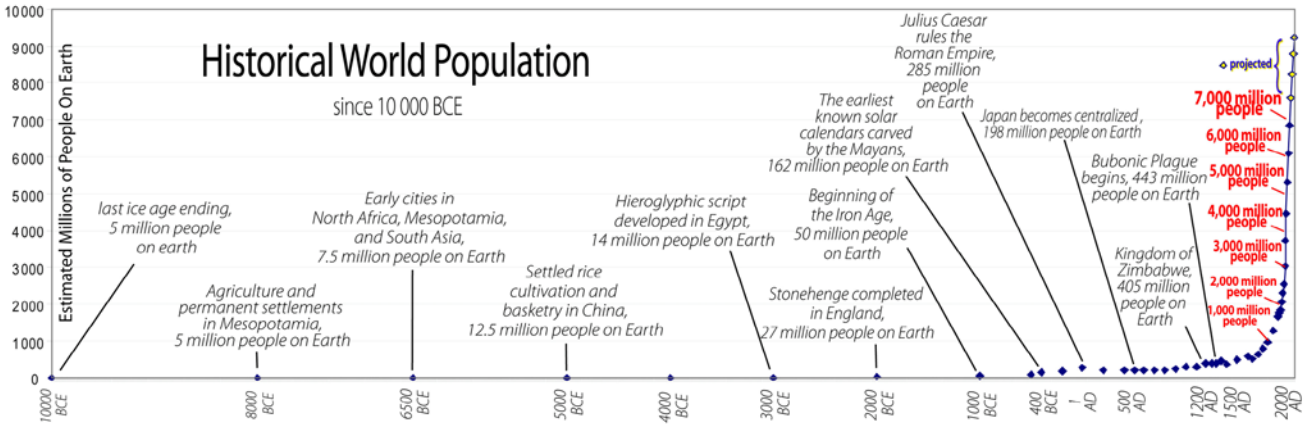
A combination of these four mutually-reinforcing conditions can quickly push a phenomenon over the tipping point from predictable to uncontrollable. When these conditions are met, whether non-native Asian carp introduced into Lake Michigan, the Ebola virus in Guinea, or terrorist cells in the Middle East, the level of complexity increases, demanding new approaches and reactions from incumbents. The same phenomenon of complexity can apply to businesses as well: a Silicone Valley startup from a garage can render an existing player's business model irrelevant overnight. But our business tools and skills have not kept pace. Consider these research findings on how much a human brain can process: the maximum number of chunks of information humans can process simultaneously is seven (plus or minus two).[13] Focused attention can only hold up to four concepts at a time.[14]

The number of interdependent variables, and the resulting permutations of outcomes a leader must consider to make good decisions, has long exceeded seven, let alone four. There are now simply too many new variables in the decision-making equation for one smart leader to consider all the moving parts and make effective decisions. Similarly, AlphaGo couldn't have won if it followed the brute-force search method that worked for narrow AI to beat humans in other less complex games. It needed a fundamentally new approach—and so do leaders now, in the face of a more complex business environment.

Additionally, the speed with which new variables enter the system is accelerating exponentially. It took 99 years for the telephone, invented in 1876, to reach 90% of the US households, but only 20 years for the cell phone, first sold in 1984, to achieve the same 90% penetration level—and the internet spread even faster.[15,16]



As the economic standards rose, which has lengthened life expectancy, the world population has increased exponentially. The resulting increased density creates more frequent interactions, which result in higher complexity.



UNEP-GRID and US Census Bureau. 2011

As the number, speed and density of variables multiply, the degree of interdependence among the variables is also intensifying, producing a butterfly effect: a flap of a butterfly's wing in Brazil can set off a cascade of atmospheric events that, weeks later, spurs the formation of a tornado in Texas. When variables involved are interdependent, a small change in one state causes large effects at a later stage, because of the sensitive dependence on initial conditions. The increasing level of interdependence and

the resulting unpredictability in the world today makes doing business very challenging for leaders.

Before we establish the leadership competencies required to win in complexity, complexity should be more clearly defined. I define complexity as "the unpredictable result of many self-organizing, interdependent agents learning by profuse trial-and-error experiments." Complexity can be both positive and negative. An example of negative complexity is found in this story: a fruit vendor sets himself on fire in Tunisia and causes Great Britain's exit from the European Union. How are these two events related? To explore the increase of interdependence in our globally connected world, let's look at this chain of events in detail.

December 17, 2010, began as a typical day for Mohamed Bouazizi, a young fruit vendor in Tunisia. He headed to the market to sell produce in the streets to support his family. The night before, he had purchased his produce on credit. Now he pushed his cart to market, hopeful of good profit… until the police arrived. Because he had no permit, they fined him $7, which was more than he could hope to make in a single day. "What do you want me to do?! Steal?! Die?! How do I make a living?!" he exclaimed with a desperate cry, punching the air with his fist. In despair, with no other way to protest, he doused himself with gasoline in the midst of traffic. He stood in front of the municipality building, his clothes dripping in gasoline and his cheeks flushed with rage. Then he struck a match, igniting himself—and the frustration of all Arab youth.

People around him took pictures and videos of this incident, and the news rapidly went viral on social media. His plight resonated with a massive number of people, inciting huge demonstrations and riots. At Mohamed's funeral, marchers chanted, "Farewell, Mohamed, we will avenge you. We weep for you today; we will make those who caused your death weep." Twenty-eight days after Mohamed's self-immolation, Tunisian President Zine El Abidine Ben Ali fled to Saudi Arabia, stepping down after 23 years in power. So began the Arab Spring.

When the Syrian people rose up against Bashar Al Assad, instead of stepping down, like many of his counterparts in other Arab countries, he led his country into civil war, producing millions of refugees. Seeking safety and opportunity, these refugees poured into Europe and Britain, stretching the limits of social support systems and challenging the

practicality of the Schengen Agreement, which made it possible for people to move freely within the EU boundaries. The growing public discontent about these refugees pouring in from Europe resulted in the Brexit referendum to leave the EU.

This chain of events shows just how much more complex the business environment is today than in simpler times. If fewer people had cell phones, as was the case just a decade ago, they wouldn't have been able to capture Bouazizi's immolation. If fewer people were connected on social media, the news wouldn't have gone viral. If fewer people had access to TV, radio, and internet, they wouldn't have been inspired to rise up against their own regimes. If fewer refugees had access to transportation to take them from Turkey, Italy, or Greece, they wouldn't have been as able to flee to England or Germany, the more affluent countries of the EU. The increased interdependence among the many variables involved resulted in Brexit—a result that couldn't possibly have been predicted from the initial event of one fruit vender's self-immolation. That unpredictability is itself a hallmark characteristic of complexity. This is the complex environment businesses operate in today. It is similar to a game of Go: one can't guess how the game will turn out from the initial moves, because the endgame is so interdependent on moves throughout the game.

This is an example of negative complexity because it poses challenges to business leaders' effective decision making. Negative complexity typically happens outside the organization. An example of positive complexity would be jumpstarting a radical innovation such as inventing a phone. Positive complexity typically happens inside the organization. A higher level of complexity increases the organization's options and ability to respond to external challenges. Negative complexity can be harnessed to create positive complexity because the underlying principles that govern both are the same.

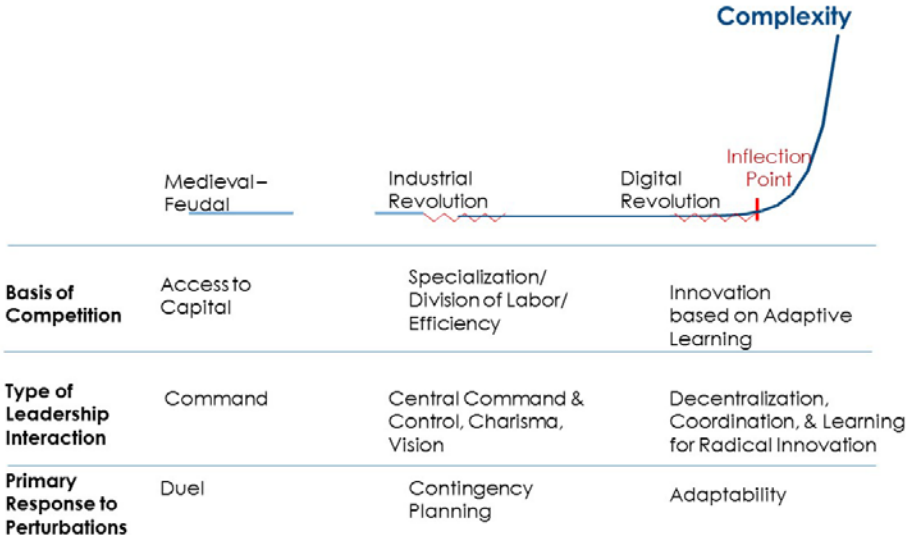
Change in the basis of competition

This increased (negative) complexity requires a whole different set of leadership skills, but businesses are still using tools, models, frameworks, structures, and management practices designed for the much simpler economy of the Industrial Revolution.

The basis of competition—how value is created and how you win—has changed in a massive way. In the simple economy of the Middle Ages, the basis of competition was

access to capital: a feudal lord put workers on land to create value and profit. Leadership meant giving orders.

The Industrial Revolution changed all that. The basis of competition became maximizing efficiency through a division of labor, specialization, and standardization. To achieve this goal, organizations concentrated power among a few smart leaders at the top, who developed strategy, allocated resources, and disseminated orders. In this model, information, power and responsibility all resided at the top. Information is formed at the point of interaction with customers, which was then sent up through the ranks to the top. This hierarchical model was designed to increase efficiency by reducing variances, or inconsistent outcomes. Corporations wanted to measure, control and minimize variance, which gave rise to corporate initiatives such as Six Sigma, Total Quality Management, and Enterprise Resource Planning. In this mechanistic, predictable environment, effective leadership was defined by individual skills, such as charisma, vision, and technical expertise.



The digital revolution of the 21st century has changed the rules of competition in a massive way yet again, requiring flexibility and adaptability. In a post-digital-revolution era, trying to predict, control, and eliminate variances is a losing game. For one, efforts to reduce variance inevitably meet the law of diminishing marginal returns: the cost of reducing variance eventually exceeds the benefit. In addition, the goal of controlling and

minimizing variance is deceptive, because we don't know what to measure in a complex environment, and we can't control what we can't measure. Too many interdependent variables interact dynamically with each other to pin down what to control. The minute we figure it out, what we need to measure has changed.

The speed with which these fast-changing dynamic environment is producing information has exceeded the speed at which traditional bureaucratic hierarchy can send information through its chain of command. As a result, decoupling of information, power and responsibility has taken place. Information resides with frontline employees but power and responsibility resides with top managers. Hence, employees cannot take action in a timely fashion, which creates inefficiency and ineffective decision making, a deadly situation in this fast-changing complex world.

Harnessing complexity

Today, in the face of so many new and interdependent variables creating so much unpredictability so quickly, the basis of competition has changed. We must shift from the Industrial Era's efficiency and accuracy to the Digital Era's focus on adaptability and innovation.

The more complex post-digital-revolution business environment makes the mechanistic efficiency model ineffective. The very premise of Six Sigma—that we can predict, control, and reduce variability—is at odds with the principle of unpredictability and complexity in today's business world. Variability is the essence of the game, not a noise to be eliminated. *Leaders should not be afraid of complexity, but increase complexity to use it to their advantage.*

Turning complexity on its head, organizations can use the very principles that pose significant challenges to their advantage by *increasing* the speed, interdependence and variety of input in the organization. Increased adaptability and a higher probability for mass adoption of products and services will result. Another result is radical innovation. Radical innovation is an unpredictable result of many self-organizing, interdependent employees following simple rules and self-organizing. Radical innovation cannot be designed or planned; it can only be fostered or facilitated. As we've seen at Google, these

principles of self-organization, flexibility, diversity of thoughts, simple rules, and profuse experiments improve one's chances of survival and radical innovation. Therefore, new leadership competencies required in this more complex environment include tolerance for ambiguity and diversity, agility, flexibility, transparency, adaptability, resilience, and connection with others.

When we harness complexity, the very factors that make business more complex also create the potential for positive complexity and wild success. For example:

- To increase the volume of new variables, organizations need to increase variability of input by creating diversity of thought.
- To increase the speed of interaction, teams in organizations must share information with complete transparency, remove any friction in the communication process, and constantly make iterative improvement using simple rules. Increase self-organization of frontline employees who have more information. Push power and responsibility down to where information resides so that information, power and responsibility can all reside at the same place.
- To increase density of interactions, increase frequency of interactions. House employees in cubicles with low walls in confined spaces. Design a path to the cafeteria and snacks so that employees from departments that would never interact in a normal course of business would have to run into each other.
- To increase interdependence among employees, a networked team structure should be in place to improve connection among team members, replacing the obsolete traditional silos in hierarchical order. Create an environment where people feel a sense of belonging and connection.

This is how AlphaGo beat Lee Sedol and how Google became one of the most innovative companies in the world—and it's how any organization can transform itself to succeed in this new digital era and create positive complexity. We'll cover more on how to harness complexity in the next chapter.

By the way, in case you lose sleep over the possibility of a DeepMind-turned-Skynet obliterating the human race, Google is developing a kill switch—and it's not sniffer dogs. Rest assured the android terminators won't take over our world.

Radical Innovation

There are two types of innovation: incremental (first-order change) and radical (second-order change). Radical innovation redefines industry dynamics and changes the rules of the game in a fundamental way, never to be the same again. Radical innovation takes a long germination time. Profuse experimentation and the iterative adaptation based on the results of these experimentation builds the momentum, often well below the radar screen. Radical innovation surfaces at the critical inflexion point when momentum has become large enough. Radical innovation happens when many agents take cues (feedback) from the environment and adjust their behavior using simple rules to speed the reaction time. Radical innovation requires an open system in which information for feedback and adaptation flows without friction. It often results from accidental, spontaneous recombination of existing ideas and tools because second order change happens as a result of growth of variances or errors. As such, speed to generate meaningful variances from iterations of trials is more important than perfection for radical innovation. Radical innovation cannot be planned or choreographed; only fostered and nurtured. Once manifested, radical innovation sustains for a relative long period, until the next radical innovation redefines industry dynamics. Radical innovation co-evolves with the environment. Each of these concepts will be unpacked in the remaining chapters.

The role of neuroscience in leadership

In our desire to create positive complexity, understanding how our brains work can help us greatly. *Epigenetics* is a field of neuroscience that studies how interactions with the environment change gene expressions and change what genetic materials we inherit from our parents in our DNA will be activated and transmitted to the next generation. *Epi-* means "around or outside of" and genetics is related to our genetic information encoded in DNA. Epigenetics show the changes in our genetic materials outside of the DNA, meaning from our interactions with the environment. Epigenetics is redefining molecular biology,

neuroscience, epidemiology, and many other related fields of study. It turns out that epigenetics holds vast promise for leaders (and followers) everywhere.

Recent neuroscience studies substantiate that neuronal connections and brain structures—once thought to be inherited and unchangeable—actually change over time. In the past, our brains' responses to stimuli were thought to be predictable and predetermined. But recent studies tell us we can *change our brain's firing patterns* to generate the emotions and responses we choose to experience. Our business environment is no longer deterministic, and neither are our brains. Both can adapt to a new environment. This principle of *neuroplasticity*—our brain's ability to change and adapt in response to experience—is now accepted by most mainstream neuroscientists. Depending on what kind of experiences we are exposed to, the brain creates different neural connections, which in turn elicits different emotions and behaviors. Depending on which neurons get stimulated, certain connections get stronger and more efficient, while others are pruned.

Why epigenetics matters to business leaders

How does this relate to the skills required to win in complexity that we covered in the previous section? Our past experiences program messages in our brain, which can make it difficult for leaders to practice the skills necessary to harness complexity, such as embracing a diversity of thoughts, practicing transparency in communication, and allowing others to self-organize. Have you ever worked for a boss who was inflexible, hoarded information, micromanaged, and was not open to your ideas? If you have, you know how miserable your life can get. If you ARE one, well, heaven help you… no, that's all the more reason you need to keep reading this book, so you can learn how to change! These bosses not only make our life miserable and sap the last drop of life energy out of us, but they are also unable to navigate through complexity. Chances are, their brain perceived that acting in that ineffective way was their best option, for often erroneous reasons—which highlights the need for self-management.

Understanding and harnessing the epigenetic nature of our brain can help us modify the past programs stored in our subconscious memories, and change how we tend to behave.

For example, becoming aware of how one's body tightens when others voice contrary opinions helps leaders identify a tendency to downplay others' ideas. This awareness assists leaders to change how they interpret incoming signals and trace the source of the tension, which is often a result of past experiences. Then they can make a thoughtful decision to consciously change how they interpret the incoming signal and change how they respond. This process changes the firing patterns of the neurons to the point where s/he is triggered less.

My research

Given the ever-growing complexity of the business environment, and armed with the knowledge of the epigenetic nature of our brain, I set out to learn:

- What effective leadership competencies are for organizations in a complex environment
- How "good" and "bad" leadership competencies affect the bottom line
- How much money people are willing to forego to work for a "good" boss and how much more they require to tolerate working for a "bad" boss
- Which leadership competencies best predict good performance evaluation and employee-turnover intention
- Which leadership competencies are most necessary for radical innovation

As a leadership consultant, executive coach, and organizational scientist, I have worked with many executives around the globe and long wrestled with these questions. In search of answers, I conducted two rounds of global leadership research.

I wanted to learn what leaders see as the most important leadership competencies, based on their evaluation of their own bosses. In that first round of research, leaders identified sixty competencies. I explored the top ten to initially identify a consistent pattern for what people around the globe see as the most vital leadership competencies. I refined them in an article published by Harvard Business Review (https://hbr.org/2016/03/the-most-important-leadership-competencies-according-to-leaders-around-the-world). The article generated a

huge response from readers all around the globe, because it confirmed the universal belief that HBR readers intuitively hold about what makes leadership effective and what makes life difficult for followers.

The second round of research from 517 global leaders refined 61 leadership competencies into six key leadership competencies. Sophisticated statistical modeling on my data revealed the following:

1. There are two distinct groups of leaders: those who excel at leadership competencies vital to win in complexity—whom I dub Quantum Leaders (40% of all leaders)—and those who don't, which I call Mechanistic Leaders (60%).
2. The leaders identified six distinct competency groups necessary to deliver radical innovation.
3. The difference in the turnover intent of followers who work for these two groups is 37% (61% of those working for Mechanistic Leaders have an intent to quit within twelve months, versus 24% of those who work for Quantum Leaders).
4. This difference translates to a $783 million hit to operating expenses for each Fortune 500 company.
5. Each Fortune 500 company would have to generate an additional $4.5 billion in topline sales to make up for this additional hit to this operating expense.
6. People are willing to forego up to 39% of their compensation to work for a Quantum Leader. (The corollary is that they require 39% additional pay to tolerate working for a manager who does NOT demonstrate these competencies!)
7. The second round of research refined the sixty leadership competencies required to win in complexity into six key leadership competencies in three categories: safety, connection, and learning that leads to radical innovation, where each category requires a prerequisite (self-management for safety, differentiation for connection, and learning for radical innovation).

8. Employees are willing to forego more of their pay in order to feel safe than the other two categories. They are willing to forego 22% of their compensation in order to work for a leader who provides safety (or, they demand an additional 22% to put up with working for a manager with whom they do NOT feel safe). This flies in the face of the "radical candor" or "front stabbing" lamented by the *Wall Street Journal* or the "squeeze-as-much-as-possible-out-of-your-employees" philosophy reported by the *New York Times* to be practiced in some companies.

9. Next, people are willing to forego 12% of compensation for connection and belonging (in other words, they demand getting paid an additional 12% to put up with working for manager who does not demonstrate these competencies).

10. Finally, they are willing to forego 5% of compensation for learning and growth (or need to be paid an additional 5% to work for a manager without competencies related to learning). Even though learning is the most important goal for organizations, we can't get there unless we satisfy our safety and connection needs first, and this is reflected in the research participants' responses of what they value most.

What is amazing about these findings is that the leadership competencies identified by global leaders (safety, connection, and learning) are *exactly* the same needs, in the same order, that our brains have been optimized to fulfill by evolution.

You can take a complimentary leadership assessment to see where you rank vis-à-vis other global leaders on these leadership competencies by going to my website: www.sunniegiles.com/assessment. Reviewing the results will make the content of this book more relevant to you.

Our brains demand safety, connection, and learning, in that order

Our brain has evolved over millions of years to make us the dominant species, on top of the food chain. The most primitive part of our brain is the brain stem, which is in charge of keeping us *safe* by recognizing even subliminal signals of threat within

milliseconds. If the incoming signal is deemed safe, then it proceeds to the limbic system, which is in charge of helping us feel *connected*. Once we feel connected, the signal can be processed in the next, most evolved part of our brain, the cortex, which is in charge of *learning* and adapting based on feedback. These three layers of our brain are hierarchical,[17] meaning the safety needs of the brain stem trump the connection needs of the limbic system, which in turn releases the innovation capacity of the cortex brain. The responses of leaders all around the world confirm neuroscience! We cannot learn and create radical innovation before we feel safe and connected. We will cover this concept more in detail in Chapter 3.

Leadership competencies to harness complexity

At the INSEAD business school in France and at Xerox in Palo Alto, researchers discovered that in a number of industries, long periods of incremental improvement tend to be interrupted by short periods of radical innovation: sudden shifts that determine a new pattern of technology diffusion, rather than a series of small improvements over time.[18] This type of radical innovation requires many failures in iterative experiments by interdependent, self-organizing employees, which gives rise to an unpredictable emergent pattern in which the whole is greater than the sum of its parts—one definition of complexity.

My research identifies six competencies required to win in complexity. Let's look at the hierarchical building blocks leaders must achieve to lead an organization through complexity. In ascending order, they include:

- Self-management
- Creating safety
- Strengthening differentiation
- Providing connection
- Learning and adapting
- Facilitating radical innovation

Each of these competencies will be covered in more detail in respective chapters. You will also be invited to take your own leadership assessment to see how you compare to other global leaders (Instructions on how to take the online Quantum Leadership Assessment are in Chapter 4.).

Towards a new paradigm of leadership

This book is a culmination of my primary research with hundreds of leaders throughout the world, secondary research from yet other hundreds of social scientists, and insights and observations from the countless hours I've spent coaching, consulting, and delivering training workshops to many executives and teams. In this book, I will use research-based evidence, as well as case examples observed in my clients, to show you *how to harness and thrive in complexity.*

I will reveal what these effective leadership proficiencies are, and how they can permanently change an organization and the individuals in it. In the process, I will also provide quantified bottom-line impact for each leadership competency group, so you can prioritize what you need to work on the most.

I will offer additional insights from my research, such as:

- The discrepancy between what people identify as important leadership attributes versus what actually drives people's decisions
- Which leadership qualities have the greatest impact on individual performance evaluation
- Which leadership attributes and competencies make the greatest difference in preventing turnover
- Which leadership attributes and competencies make the greatest difference between "good" leaders (Quantum Leaders) and "bad" leaders (Mechanistic Leaders)
- How the Quantum Leader facilitates radical innovation

I will also address the dilemma of the current corporate learning model: people are taught, but they are not learning. According to *The Wall Street Journal*, U.S. firms spent

about $156 billion on employee learning in 2011, but some 90% of new skills are lost within a year! That is because current learning models are not harnessing the nature of our brain and the nature of humans and organizations as living *systems*, so they produce only temporary learning effects. I will show you how to harness the nature of our brain and people as living systems, discover your subconscious programs that make practicing the Quantum Leadership skills difficult, and how to permanently change them, in Chapter 11.

Let's start with a deeper understanding of complex adaptive systems, which will also reveal common patterns—shared among all living systems as diverse as people, organizations, coral reefs, and termite colonies—and establish the concepts we will use throughout this book.

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