

On Becoming Visionary

Chapter 1: Sensing Patterns

Dusan "Dusko" Popov arrived in New York on August 12, 1941, and carried with him several letters containing evidence that Japan was plotting to attack Pearl Harbor.

Popov was a Serbian double agent, working for the Abwehr (Nazi intelligence agency) and Britain's MI-6. He had light brown hair that was brushed straight back, with a slightly receding hairline that gave his face a round, heart-shaped look. He had a prominent "Slav" nose, green-grey eyes and heavy "bedroom" eyelids. He grew up the son of a wealthy Serbian businessman and enjoyed yachting and sports cars. He was a renowned gambler, gregarious flirt and playboy who freely spent money and took mistresses wherever he went.

Earlier that year, shortly after Popov was recruited to be an agent for British counter-intelligence, Commander Ian Fleming shadowed him to Lisbon's Casino Estoril, where Popov usually met Abwehr agents to pass intelligence and receive instructions. As Fleming watched, Popov placed a \$40,000 bet at a Chemin de fer (baccarat) table to force another player to withdraw. This scene became the epic baccarat battle in Fleming's first novel, *Casino Royale* and Popov, the playboy spy, would become the primary mold for the James Bond persona.

When he arrived in the U.S., Popov made arrangements to meet with J. Edgar Hoover and the Federal Bureau of Investigation, to turn over letters with secret instructions from the Nazi's on Popov's mission in the United States.

J. Edgar Hoover was the antithesis of Popov. He was short and his appearance was likened to a bulldog, with a pug nose. He suffered a childhood stutter, which he overcame by practicing speeches. He never dated nor married. To overcome his social awkwardness, he developed a large catalog of jokes he could tell in public situations.

Hoover headed the FBI from its creation in 1935 to his death in 1972.

He ran the bureau with a moralistic firm hand and a rigid dress code. His agents had to cut their hair two inches above the collar on the back. They all had to wear dark suits, white shirts, and carry pocket squares. Agents weren't allowed to spend the night at their girlfriends' apartments and they were never to get drunk.

The FBI kept Popov waiting for weeks to meet. In that time, he took an apartment on the Upper East Side, bought a sports car and went out at night. The FBI put Popov under surveillance from the moment

he checked into the Waldorf Astoria in New York and his playboy ways didn't sit well with Hoover. Hoover looked on spies such as Popov as criminals.

When Popov finally met with the FBI, he gave the agency letters that contained secret instructions hidden in microdots, a new technology developed by the Nazi's to reduce photos to the size of miniature 1-2mm dots. The microdots included instructions for Popov to gather intelligence about Pearl Harbor, including:

- Exact details and sketch of the situation of the State Wharf and the power installations, workshops, petrol installations, situation of Dry Dock No. 1 and the new dry dock which is being built.
- Details about the submarine station (plan of situation). What land installations are in existence?
- Where is the station for mine search formations? How far has the dredge work progressed at the entrance and in the east and southeast lock? Depth of water?
- Number of anchorages?
- Is there a floating dock in Pearl Harbor or is the transfer of such a dock to this place intended?
- Special task: Reports about torpedo protection nets newly introduced in the British and USA navy. How far are they already in existence in the merchant and naval fleet?

Source: Mark Riebling, *Wedge: From Pearl Harbor to 9/11, How the Secret War Between the FBI and CIA has Endangered National Security*

Instead of welcoming the intelligence that Popov brought, Hoover threatened to arrest Popov for transporting a woman across state lines for illicit purposes. Popov had taken a married fashion model to Florida, a violation of the Mann Act.

Popov's microdot letter wasn't the first or only bit of intelligence that hinted at an attack on Pearl Harbor. Earlier in the year, a German agent Ulrich von der Osten had been run over in Times Square. FBI agents found a detailed report on the defenses at Pearl Harbor in von der Osten's room. Presumably, the Nazi's were passing along or trading intelligence with the Japanese.

Even earlier, in January of 1941, Peru's minister to Tokyo Ricardo Rivera-Schreiber passed along information to the U.S. Ambassador to Japan Joseph Grew of a possible attack on Pearl Harbor. On January 27, 1941, exactly 314 days before the attack, Grew sent a memo to the State Department:

"My Peruvian Colleague told a member of my staff that he had heard from many sources including a Japanese source that the Japanese military forces planned, in the event of trouble with the United States, to attempt a surprise mass attack on Pearl Harbor using all of their military facilities. He added that although the project seemed fantastic the fact that he had heard it from many sources prompted him to pass on the information."

Source: Gordon Prange, *At Dawn We Slept: The Untold Story of Pearl Harbor*

The memo reached Commander Arthur McCollum, who headed the Far Eastern Section of the Office of Naval Intelligence in Washington. McCollum discounted the threat in a memo to Admiral Husband Kimmel.

"The Division of Naval Intelligence places no credence in these rumors. Furthermore, based on known data regarding the present disposition and employment of Japanese naval and army forces, no move against Pearl Harbor appears imminent or planned for in the foreseeable future."

Source: Gordon Prange, *At Dawn We Slept: The Untold Story of Pearl Harbor*

Warnings of an attack on Pearl Harbor continued to trickle in throughout 1941, but most of them were siloed within military or government divisions that didn't share information openly.

Further, Hoover became involved in a subtle turf war with the predecessor of the CIA, the newly created Coordinator of Intelligence (COI) William "Wild Bill" Donovan. Donovan, somewhat like Popov, wasn't Hoover's kind of person, and Hoover resented the creation of the COI as a threat to *his* FBI (it's a conflict that superseded WWII and has continued to this day), so little actionable intelligence was shared.

There were more than a dozen warning signs, some came as early as January of that year and they continued throughout the year, right up until a few hours before the attack.

A failure to Sense

There's no one reason why Army and Navy leadership in Hawaii weren't prepared for an attack. Many warning signs trickled in. None of them, however, raised a red flag in Washington or across the military.

Why did the United States fail to sense the threat?

In short, the military lacked dynamic capabilities, specifically an ability to sense the pattern of a threat in all the intelligence that it gathered..

There were cultural barriers and cognitive biases. There were human capital shortcomings and a lack of available resources. There were strong personalities who were stubbornly tied to their lack of perspective.

The agencies that were supposed to coordinate and work together didn't. The Navy didn't share with the Army. Washington didn't share with Honolulu. The FBI didn't share with the Coordinator of Intelligence.

The systems that were designed to provide a failsafe and redundant ability to sense threats failed at every level.

In his preface to Roberta Wohlstetter's 1962 book *Pearl Harbor: Warning and Decision*, Thomas Schelling put it well:

"Surprise, when it happens to a government, is likely to be a complicated, diffuse, bureaucratic thing. It includes neglect of responsibility, but also responsibility so poorly defined or so

ambiguously delegated that action gets lost. It includes gaps in intelligence, but also intelligence that, like a string of pearls too precious to wear, is too sensitive to give to those who need it. It includes the alarm that fails to work, but also the alarm that has gone off so often it has been disconnected. It includes the unalert watchman, but also the one who knows he'll be chewed out by his superior if he gets higher authority out of bed. It includes the contingencies that occur to no one, but also those that everyone assumes somebody else is taking care of. It includes straightforward procrastination, but also decisions protracted by internal disagreement. It includes in addition, the inability of individual human beings to rise to the occasion until they are sure it *is* the occasion--which is usually too late. (Unlike movies, real life provides no musical background to tip us off to the climax.) Finally, as at Pearl Harbor, surprise may include some measure of genuine novelty introduced by the enemy, and possibly some sheer bad luck."

Schelling's eloquent preface is relevant in sensing through uncertainty. He added, "There is a tendency in our planning to confuse the unfamiliar with the improbable....what looks strange is thought improbable; what is improbable need not be considered seriously."

This last statement can be taken to heart by any organization that doesn't recognize the fact that unimagined novel or potential outcomes can be kept hidden by uncertainty and by our biased expectations. As Schelling said, we confuse the unfamiliar with the improbable, even though they are wholly unrelated.

Although Schelling describes the organizational failures that led to missing the many warning signs at Pearl Harbor, it also points to the possible failures that can and do occur in any type of organization whose future and survival relies on sensing the external world (markets, consumer behaviors, competitive shifts, etc...). It can serve as a warning to any organization, and especially to those that may suffer from overconfidence, steadfast complacency and a pure short-sightedness of the possible when it comes to their particular area of expertise. (Later in the chapter, in the section titled *Specialists and Generalists*, we'll revisit this problem.)

We let our logic interfere with our ability to sense novelty and possibility.

Sensing and Knowledge

Sensing is the ability to connect bits of information and knowledge in order to recognize new patterns. Firms can gain a sustained competitive advantage by honing this capability to see patterns emerge more quickly and imagine possible futures from those patterns.

Knowledge is scarce. Today's firms depend on knowledge to succeed and adapt. It's often the most valuable asset in a firm.

Knowledge is also difficult to imitate and typically has little value without context and connectedness (to other knowledge, to processes, to people, to routines, to culture). It can't be sold easily.

Today's firms are largely knowledge based. A firm's value today is increasingly held in its intangible assets and knowledge and less in its equipment and size. Intangible assets and information have replaced tangible assets and production processes.

Increasingly, firms have to develop their adaptability if they want to continue to succeed or even survive as the pace of change increases in the world.

Adaptability really is about a firm's ability to gain knowledge quickly when it's most needed. This is sensing.

My colleague and friend, who's a world-renowned economist and business strategist at U.C. Berkeley's Haas School of Business, David Teece calls this ability, "Dynamic Capabilities."

In the past, firms relied less on knowledge and more on building or acquiring tangible assets required in the production process. Sensing, for these firms, was less critical and focused on internal statistical efficiencies and external market share in stable environments.

Globalization and technology have increased access to information and the speed with which we can get information. Anyone or any organization, whether it's a one-person startup or a firm with 300,000 employees, can sense and find critical information that may lead to new insights about consumer behavior, new markets or dying industries. The individuals and firms that can find and link relevant information in new and meaningful ways, then act on that information quickly will be a step ahead of competitors who are slower in sensing or seizing opportunity, wherever they may reside.

Big data and artificial intelligence has attempted to mechanize the process of sensing, using powerful computing algorithms to identify correlations within or between information sets. Companies like Amazon, Facebook and Google, which have access the largest data sets, are at an obvious advantage in crunching data and finding correlations. But they're also most likely to get bogged down in data noise and perhaps lack true understanding.

The real question: Can big data lead help leaders become visionary?

It's unlikely. It certainly can be used in targeted marketing. Oftentimes, in not so ethical ways, as we've found out with Cambridge Analytica and other Facebook partners who used data for manipulation and disinformation campaigns.

The bigger question is, *Can it tell us where the world is headed?*

I personally don't think so.

Chapter 2: What is sensing?

At a basic, anatomical level, sensing is how we gather information about (and interpret) the world around us. We taste, smell, touch, see and hear the world. Using our senses is key to our existence and these senses (these sensing abilities) tell us what we need to know about our surroundings.

For the sake of this book, sensing has two main processes: Information gathering and making sense of that information.

Each of our senses collects information about our surroundings and we have the ability to focus on what information is collected. For example, we can take a bite of pizza and experience its taste. Or we can choose to look out the window and take in the scenery.

These actions are choices we make about where and how to sense. Of course, we collect a lot of information that we don't necessarily choose to focus on. There's also noise that we filter out. When we look out the window, we notice some things and don't notice other things. Our sight is especially receptive to movement, so we might notice a dog in the yard before we notice things that aren't moving (e.g. a rake or shovel).

The other process in sensing is making sense of our observations. First, there's recognizing things that we've experienced (seen, heard, touched, smelled or tasted) before. We might recognize that there's a dog in the yard because we've seen and known other dogs (in person and in books, on TV, and elsewhere) and know what a dog is. Second, we put the things we recognize into the context of the entire scene, everything we sense plus our complete historical makeup. Finally, we interpret the whole of it, we make some sort of sense of things.

Sensing is also a key part of the dynamic capabilities framework. It's a process of learning and discovery, about recognizing changes in the environment and connecting those changes with the capabilities and potential of the firm. This process is about becoming visionary.

It's what visionaries do. They sense subtle changes in the environment that might suggest an emerging pattern, and within that pattern, they can recognize possibility, in terms of both threats and opportunities. Then, they figure out how they can move their firms to take advantage of the opportunity or respond to the threat.

Anyone and any organization can learn to sense better, to become visionary. Visionaries don't come from a certain pedigree, though many of us sometimes attribute extraordinary abilities to them. These visionaries often draw their abilities from creativity and wonder. Academics and journalists alike have created extensive mythologies about visionaries as superhuman. Our advice is to ignore the academics and journalists, who insist on telling us tales of visionaries based on the hero myth and some so-called "magical" ability or tool. Any well-rounded person, in any capacity, can learn to see like a visionary.

Organizational sensing within the dynamic capabilities framework is much the same. It includes two processes:

Process 1. Gathering Information

Process 2. Making sense of the information

These two processes aren't always easy or obvious. A large number of external factors influence them in countless ways. For example, we may gather the right information, but we may be hindered by our cognitive biases from interpreting the information, from making sense of it.

The patterns that we recognize contain within them a narrative. That narrative may point to opportunities or threats. These opportunities or threats aren't the pattern; they are possibilities that the pattern (narrative) suggests. They are contained within the fabric of the pattern, the sense we make of the information. This fabric is continuous and can illuminate possibility and the future.

Philosopher John Dewey has a term for this unifying vision, this pattern. He calls it "synthesis," when everything comes together into the whole. Synthesis unifies. It is the opposite of analysis, which breaks information down into smaller and smaller bits.

Let's take a look back at J. Edgar Hoover's FBI. Not only did Hoover's biases get in the way of Popov's intelligence, Hoover's agency largely failed to look for patterns in all the data they collected. The tight FBI bureaucracy functioned as a large library, a massive silo where information was stored. Agents from over 200 field offices sent teletyped data to the headquarters in Washington each day. A legion of administrators indexed the data, so it could be easily retrieved, if needed.

The problem, however, was that the FBI employed no analysts to make discoveries in the data, to look for trends or hot spots or intelligence that could be acted upon, no one to assess the whole of it, to find patterns.

Author Mark Riebling, in his book *Wedge: From Pearl Harbor to 9/11: How the secret war between the FBI and CIA has endangered national security*, said Hoover's agents had been "taught to look, but not to see."

They were excellent at gathering information (Process 1), but lousy at making sense of the information (Process 2).

This wasn't the only problem with the discovery processes.

Information sources abounded: Naval intelligence in Washington. Army intelligence in Washington, the FBI, the COI, The Navy in Hawaii, The Army in Hawaii, other local sources in Hawaii, the embassy in Japan, etc... But these sources were largely independent of one another and information wasn't cross analyzed or synthesized. Further, the people who could act on information didn't see it in time. It's the problem of too many silos.

Too often valuable information that could help us sense market shifts or new threats is stored where it's not useful. In the Pearl Harbor case, small bits of information about a possible attack were gathered in multiple areas, but this information never converged into a pattern in time, it never synthesized.

Being able to sense opportunities and threats requires gathering, then converging data sources and information (Process 1), then analyzing it for possible patterns (Process 2).

But, if information is stored in multiple silos, an organization has failed to gather information in a form that's usable and has lost one critically important aspect of sensing.

Sharing and analyzing information across an organization is critical to developing insight about possibility and about the future.

Failure to See

As Riebling noted, sensing is not only about looking, but about seeing. It's about recognizing the value in what is seen. Many market disrupters are spotted in the early stages by the very institutions they'll later disrupt, but those institutions (those mature companies) often choose to ignore them or underestimate their ability to transform their industries and markets and threaten their very businesses.

The auto industry is learning this lesson first hand. For as long as anyone can remember, it was Detroit against Japan against German and European engineering. The real threats were ignored or never seen. The race was to make better automobiles, more efficiently. It was to divvy up the market by economic, sex and age groups. The field of vision was very narrow. They ignored what was happening at the fringe.

Ten years ago, no one in their right mind in the auto industry would have suggested that Google or Uber or ZipCar or Apple or Tesla might eat away at the very foundation of the auto industry, not only threatening to disrupt it, but threatening possibly to destroy it.

The electric car was something that the mainstream didn't care about. Self driving cars were a fantasy, something out of *The Jetsons* maybe. Worse yet, do people even want to own cars anymore? In 2011, consumers aged 75 and up were buying cars at a more frequent rate than those aged 18-24 and 24-35.

Detroit was stuck in its mindset about the auto market. To the executives in Michigan, autos were meant to be purchased and owned. Ownership, in their minds, was more relevant than transportation. Further, they thought mainstream consumers weren't interested in an electric car.

Over the past 15 years, New Urbanism emerged as populations migrated back to the cities. Everyone left the cities for the suburbs in the 1950s, and that trend continued through the 1980s. By the mid 1990s, when commutes from the suburbs were reaching an hour or more each way, people started coming back to the cities. This shift occurred exactly as Millennials were coming of age. Detroit missed this shift and consequently, what it would mean for their market.¹

As people flocked back to the city, they turned more and more to ride sharing and other forms of transportation. Families that may have had two cars in the suburbs found that one was more than adequate in the city. Some were opting not to own a car at all. What do you think this meant for Detroit?

¹ Interestingly, China is moving in the opposite direction, a counter cycle, with an emerging middle class that sees car ownership as a signifier of their status and a means to privacy during the commute.

Another change was also under way.

Along with New Urbanism, the Internet and social media began connecting people in ways that were inconceivable a generation earlier. We've become a culture of sharing.

The vacation timeshare industry has been around since the 1960s. It began in Europe when four families would pool resources to purchase a vacation home and each family would get to use the home for one full season. Each year, the four families would rotate seasons. That led to weekly timeshares, with resort hotels offering their own timeshare products. Today, AirBnB and HomeAway enable people to rent out their homes or a spare room to travelers from anywhere, for a night, for a week, even for a year. The hotel industry, like Detroit, is feeling the shock of this shift.

AirBnB and Home Away have tapped into the excess capacity of resources. Someone's vacation home might be empty 10 or 11 months a year. Excess capacity models enable someone who owns a vacation home (or any asset) to rent it during unused time to generate revenues. Social media apps and the Internet have facilitated platforms for these markets to emerge. Peer-to-peer markets for everything are emerging.

Uber and Lyft also are built on the excess capacity business model, such that anyone with a car can pick up a fee-paying passenger through a smartphone app. These companies facilitate the exchange between someone who owns an asset and someone who wants to use the asset.

This phenomena isn't confined to transportation and vacation rentals. It's occurring everywhere now. If you have a lawnmower in your garage, you can rent it out over Craigslist. Co-working is enabling property managers to fill empty office space with contracts that are like gym memberships. They understand that they can oversell capacity because not everyone will be using the space at the same time. Hotels Tonight takes unsold hotel inventory each day and puts it on the market for below market rates. This is found revenue for the hotels. Business models are being created, one after another, to unleash underutilized and idle assets.

IKEA also used the excess capacity model. They found manufacturers that had idle time and reached agreements to produce IKEA's goods when those manufacturing plants would otherwise be sitting idle. In one instance, IKEA contracted with a ski maker to produce tables during their down time. This flipped the idea of just-in-time supply chain management upside down. IKEA kept huge inventories of their products in warehouses, but that cost was more than offset by the savings they realized in finding manufacturers that had excess capacity. For those manufacturers, they had a sunk cost in their equipment and it made more sense to lease the time to IKEA at a huge discount than generate no revenues at all during the down weeks and months of each year.

While fringe startups and creative technology companies thought about these possibilities, Detroit and its siblings didn't. Now, they have to play catch up. For example, in 2016, General Motors, the largest U.S.-based auto manufacturer, was compelled to invest \$500 million into Lyft, an emerging ride-sharing service. Months later, Ford invested \$182.2 million Pivotal software. This partnership includes FordPass, which provides remote access to vehicles and also to a ride and car sharing platform. The relationship

may also lead to Ford entering the software business to develop the mechanics for a driverless car in an attempt to catch Google.

While New Urbanism, excess capacity and peer-to-peer business models were taking hold, our cars (and products) were getting smarter. Today, many cars have sensors to beep when our cars lane drift (to prevent accidents or to wake a driver who might be nodding off). They also have sensors to beep when we back up or park, so we don't accidentally hit something, or worse, someone. Some cars can now park themselves and some can self-brake to avoid an accident. Detroit was incorporating these new technologies ad hoc, but they still couldn't see the big picture.

While Detroit was putting self-parking and lane-drift safety features into their cars, they didn't seem to recognize that these smart technologies were paving the way toward a self-driving car.

Companies like Lyft and Uber have broken the transportation-ownership paradigm, but the shift isn't over. The biggest cost in their business models is the driver. The driver is also a capacity inhibitor. If Lyft and Uber developed self-driving cars, the business model would go through another major shift. They could put a fleet on the streets 24/7 and the fleet could automatically respond to the daily and even hourly rise and fall of demand, all algorithmically. And, there wouldn't be a driver cost. These are turbulent times. Of course, this would move Lyft and Uber away from an excess capacity business model.

These shifts (New Urbanism; the Millennials' coming of age; peer-to-peer sharing, the rise of artificial intelligence in products) have disrupted Detroit and will disrupt other sectors too. Detroit used to sell cars. Now, they have to change their business models, to adapt, to sell transportation services, not just car ownership.

Why did every last CEO and senior executive in the automobile industry over the last 15 or 20 years miss this shift until after emerging competitors began disrupting their markets? We'll come back to this question with an answer later in the chapter. For now, we'll leave Detroit executives to meditate on Schelling's words, "What looks strange is thought improbable; what is improbable need not be taken seriously."

Chapter 3: Types of Risk

Risk or Uncertainty?

If you've read any Nassim Taleb or remember Donald Rumsfeld's famous quote, you've probably heard the term, "Unknown Unknowns." These are blindspots to reality, to what can really happen. Taleb often invokes philosopher David Hume's swan analogy to illustrate our lapse in logic in thinking about what can happen, "No amount of observations of white swans can allow the inference that all swans are white, but the observation of a single black swan is sufficient to refute that conclusion."

Our perception of reality overrides this basic logic. This is our blindness.

In short, despite all the evidence that we can gather about our industries, about reality, we cannot be certain our assumptions are factual. We can never see the whole picture.

Too often, executives mistake uncertainty for risk. They know about risk and they know how to analyze and plot an actionable course that accounts for risk.

Porter's Five Forces strategic model is exclusively about risk against known factors. It's failure for the business executive is that it ignores uncertainty and possibility, complexity and chaos.

All of tomorrow's major market disruptions are unknown unknowns. You may run an energy company or a financial services firm or a real estate empire or an insurance provider. Will your industry look the same in 50 years? What about in 10 years? Five years? What about next year?

The thing about unknown unknowns and uncertainty is we can't know what the threat is nor when or how it will strike. What we can know about unknown unknowns is that they exist and that they will become known at some point. And when they do, they will surprise most everyone. Then, after the fact, they will seem so obvious that we can hardly believe we missed them in the first place.

Chapter 4: Misunderstanding Data

Mathematics of Roughness

Benoit Mandelbrot was a Jewish mathematician whose family lived in a Warsaw ghetto. During the Depression, his father's business collapse and his family moved to Paris, taking a padlocked train across Nazi Germany. When Paris fell to the Germans in WWII. Mandelbrot was 14. He fled to Vichy and then Lyon with fake papers about his ancestry. Following the war, he studied in Paris at Ecole Polytechnique, and later at the California Institute of Technology.

Mandelbrot is considered one of the fathers of Chaos theory and he invented fractal geometry (the mathematics of roughness). We've all seen colorful pieces of fractal artwork based on his theory. Fractals also occur in nature. Picture a snowflake. Or the British coastline from space.

He saw simplicity and beauty where others saw chaos and messiness. He relied on visual insight as a way to understand the way of things.

In talking about turbulent markets in his book, *The (Mis)Behavior of Markets: A fractal view of risk, ruin and reward*, Mandelbrot said people think that if they study and analyze enough of data, they will better be able to predict outcomes. The reason: We believe in the word, "Because." Thus, we think we can predict outcomes. If we know why something happened (cause and effect), we can assess risk and forecast events.

Just like we mistake "uncertainty" for "risk," we also mistake "correlation" for "cause and effect."

The problem, said Mandelbrot, is that causes are usually obscure. "Critical information is often unknown or unknowable."

Despite the information gaps, Mandelbrot says, we have a "human need to find patterns in the patternless."

Thus, senior executives analyze silos of data, trying to find answers. They often interpret modest correlations as cause and effect relationships. These correlations may be related to recognized outcomes or simply, they may be coincidental. It's often nearly impossible to tell, even through heavy analysis because open systems, such as a market or the weather, are influenced by countless variables. Many of the variables and their relationships in a complex system are unknown or unknowable.

We have more access and greater ability to analyze data about our firms, competitors, customers and markets than ever before. But, despite our high-tech corporate dashboards, we are still unable to understand change and uncertainty adequately in identifying threats and opportunities, in sensing. We're unable to forecast what the world will look like tomorrow. We are stuck with overly simplistic models of comprehension often based on a normal distribution.

Normal Distribution vs. Reality

The normal distribution (of errors), sometimes called the Gaussian distribution, is named after Carl Gauss.² The model aimed to determine the arithmetic mean of the measured values, or the "method of least squares" in statistics.

This model has become one of the foundational elements in most statistical analysis today. For an organization, it's especially relevant to estimating risk or analyzing production efficiencies, when there are only a few variables involved.

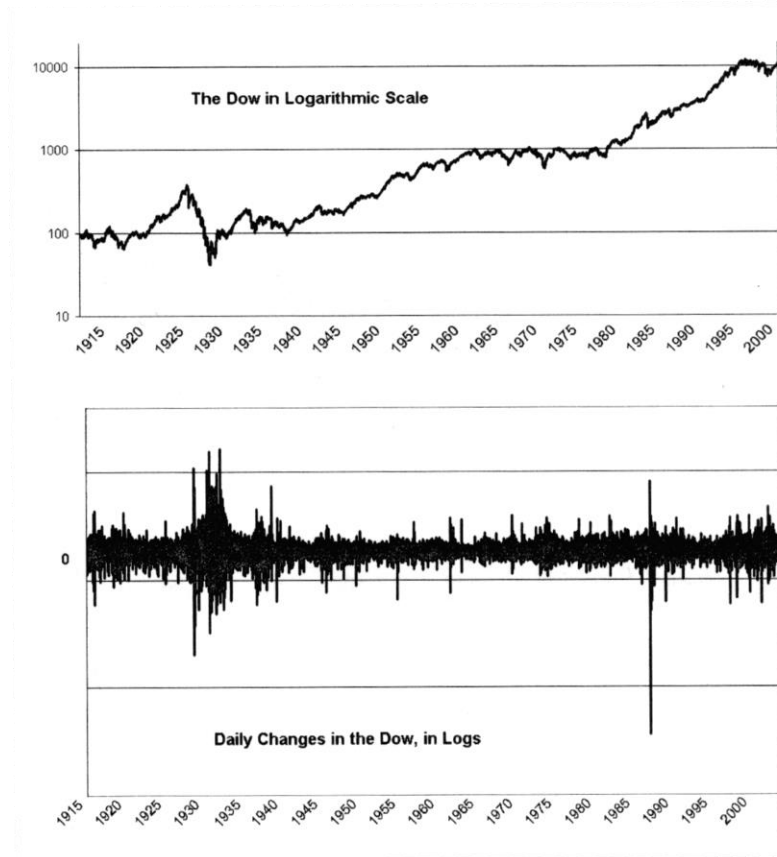
The model, while useful in many situations, can lead us to misunderstand uncertain and complex environments. It treats those complex (open) environments the same as models with only a few known variables. The Gaussian model doesn't work very well in analyzing complex systems, like the weather or the stock market or human behaviors.

Mandelbrot, in *The (Mis)Behavior of Markets*, created a series of charts that demonstrate the insufficiencies of using simple statistical models to analyze complex and uncertain systems and environments.

The first chart tracks the stock market from 1915 to 2000 in logarithmic scale. Logarithmic scale is used to scale everything such that a 1 percent change in any year looks the same as a 1 percent change in any other year. The chart should look like it felt people living through it. The top section of the chart shows the value of the Dow while the bottom section shows the daily price changes of the Dow.

² There's debate as to whether Gauss or Adrien-Marie Legendre was the first to use the normal distribution as a statistical tool.

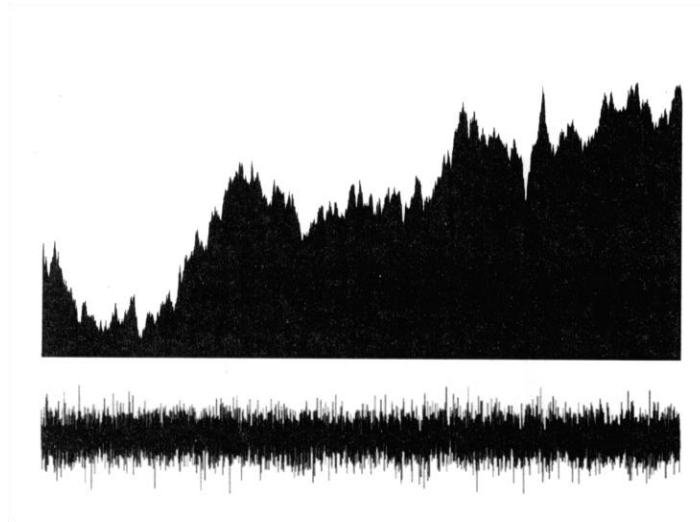
Dow Jones Price in Logarithmic Scale



For comparison, Mandelbrot created a simulated chart using the Bachelier-Brownian motion model based on a Gaussian distribution that's used in financial market analysis.

The top section of the chart here doesn't look unlike the previous Dow chart, however, the bottom section shows a normal distribution of the daily price changes, which obviously doesn't mirror reality. Too often, in our industries and markets, we use a statistical model like the Bachelier-Brownian motion model to simulate or approximate scenarios of complex and open systems. These models only work with risk analysis where there are only a few relevant variables, not in trying to predict outcomes in complex and uncertain environments, like markets or technological change.

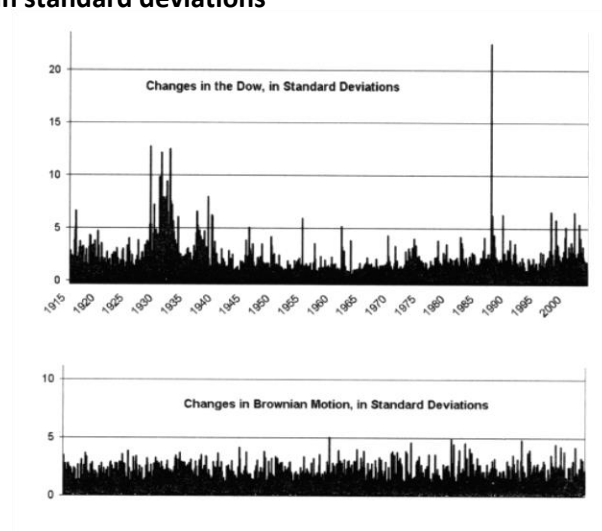
Brownian Motion Model to simulate stock market



Clearly, this method does not account for the severe uncertainty that can cause extreme standard deviations.

Here's a comparison of the Dow (top) and Brownian motion model (bottom) in standard deviations. The Dow shows that it had daily price changes greater than five (5) standard deviations recurring repeatedly while the Brownian model only approached or reached five standard deviations three times. In fact, the Dow price fluctuated by 22 standard deviations in 1987, which has a probability of 1 in 10^{50} years, which far exceeds the age of the universe (13.799×10^9 years).

Comparison of Dow (top) and Brownian (bottom) model in standard deviations



Executives are inclined to look at data patterns based on a Gaussian normal distribution (bell curve) without realizing its insufficiencies in predicting outcomes or its lack of correlation with the real world.

Statistical analysis works well when relationships are easily understood and there are only a few variables. But when applied to a complex system, many variables are left unaccounted. For example, the

Brownian motion model ignores friction, among many other known and unknown variables, when used to analyze financial markets or technological change.

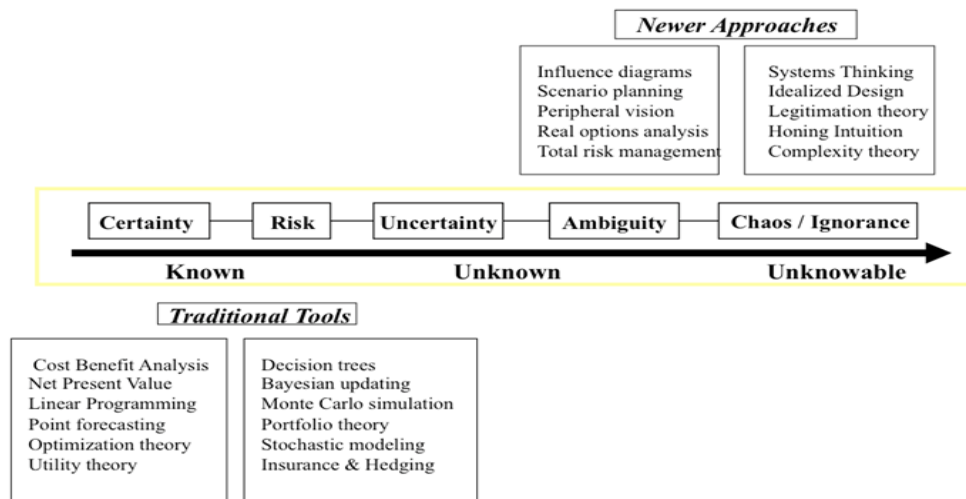
All of us fall into the trap of mistaking uncertainty for risk. In the boardroom, this can be disastrous. The tools that are used for risk assessment and measuring efficiencies, as Mandelbrot pointed out, are largely built on Gaussian normal distribution models. These tools work in highly stable environments that aren't prone to complex and uncertain weather-like disturbances. But they will give executives a false sense of security when used to analyze or predict anything in an uncertain, complex or chaotic system.

This can lead to misrepresentation of actual risks to shareholders and essentially, equates to boardroom malfeasance and ineptitude.

The tools we need in complex and uncertain environments are altogether different than the tools we need in stable and reliable environments.

Over the last 30 years, Dutch scholar Paul Schoemaker, who teaches at the Wharton School, has written extensively about uncertainty and the types of tools and methods that executives can use in uncertain environments. The chart below shows some of the types of tools for various environments, from known environments to unknowable environments.

Fig 2. Tools for Stable and Turbulent Environments



Adapted from Schoemaker (2002)

The tools on the left side of Schoemaker's chart (Known information) are all based on the Gaussian distribution model and are adequate for risk assessment and efficiency analysis. The tools at the right side of Schoemaker's chart (Unknowable information) are developed around complexity and use

intuition and associative thinking methods, like scenario planning or design thinking, which also make up the core of dynamic capabilities around sensing. These tools can be used to discover patterns and project possible scenarios onto the future.

Chapter 5: The Art and Science of Sensing

Sensing and understanding rely on our ability to connect information together (Process 2). This is typically accomplished by associative thinking.

What is associative thinking?

Generally, it's a term that we use to talk about non-linear thinking. Amos Tversky and Daniel Kahneman, who won a Nobel prize in economics for work in decision making and cognitive biases, explains that our brains are wired to make associative decisions on very little information. They called it, "Type 1 thinking," by which we're wired to make associative connections and quick decisions, with little analysis.

Kahneman refers to this as our lazy mode of thinking or thinking fast. According to Kahneman, this so-called "fast thinking" is our de facto thought system and helps us survive in an unforgiving world. He also explains that the other type of thinking, "thinking slow," (Type 2 thinking) takes a lot more focus and hard work and is based in making decisions by slow methodical analysis.

Associative thinking uses a form of metaphor to make quick connections. For example, we may jump at the peripheral sight of a stick and do so repeatedly, as we associate the stick with a snake. This hard wiring has caused us to look stupid and waste energy every time we jump, 99 times out of 100. But the 100th time we jump, when it turns out to be a snake, we've avoided being bitten.

The metaphor occurs because we substitute one thing (a snake) for something else (a stick) in our minds and make that conclusion with almost no analysis or revving up the mind to do the hard work of decision making, which by the time we've made a decision, we'd be dead if it was a snake.

We recognize the pattern of a snake in the few data points we observe in a fraction of a second in the stick. In that split second, we react immediately. It takes a longer amount of time to analyze the data closer and determine that it wasn't a snake after all. Even though that lag may only be a couple seconds, it was the difference between life and death for primitive man.

This mode of thinking is a key piece of our survival wiring and isn't exclusive to humans. Many animals carry this same reflexive-like trait and it has led to their survival as a species, as it has for us.

In today's world, we use this trait without thought to make quick decisions all the time with very little information and without doing any sort of deeper analysis. This can lead to making bad decisions over and over, and these decisions can make us look just as foolish as when we jumped at the sight of a harmless stick.

The pattern we recognize is a narrative of all the data we gather and the sense we make of it. In the case of the snake and the stick, the narrative is wrong, but we're alive because of it.

This trait has an upside beyond our survival as a species.

Even though people often spend most of their time making decisions in this lazy mode of thinking, it can be used productively to approach a problem from a new angle or exercise creativity. We were given this tool as a means to survive, but we've learned to use it in other ways.

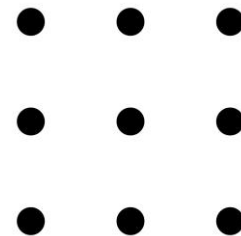
This ability to connect associatively enables us to imagine, create great works of art, explore ideas, try new things and find new connections between things in the world. We have an almost limitless ability to discover new patterns, to create new metaphors and to create relationships among things to alter our perspective and understanding of the world.

This, of course, can lead to unimaginable innovations and works of human creativity. It can also help us in sensing opportunities and threats and in developing long-term strategies.

Thinking outside the box and insight problem solving

In the 1960s and 1970s, management consultants and business strategists used a popular puzzle to demonstrate the value of non-linear thinking, which led to the overused business cliché “thinking outside the box.”

The nine-dot puzzle featured three rows of three dots. Puzzle solvers were asked to draw four straight lines that would connect all the dots without lifting their pencils. All the possible solutions required drawing past the imaginary box formed by the nine dots. The solution was referred to as “thinking outside the box,” which took a non-linear process to solve. One had to break from the constraints of the context and framing of the problem to find the solution.³



Nine-dot Puzzle

This led to an increasing interest in creativity and associative thinking as part of business strategy over the last 50 years. The best ideas might not be immediately recognizable and can sometimes be discovered by going against convention and common thinking.

Part of the process of solving the nine-dot problem is related to understanding metaphors and drawing associations between things or ideas. It begins with breaking away from the logical connection or long-standing convention that has been formed in our minds about something. In this case, we automatically form the nine dots into a box shape and that frames our approach to solving the problem and it limits us.

³ Solution



So, the first step is to break away from our existing understanding. This is also the case with metaphors and other types of associations. To understand a metaphor, we have to let go of the literal meaning of something. For example, we all understand what the phrase, "It's raining cats and dogs" means, but we have to set aside the literal meaning of cats and dogs to do so.

Humor often draws on associative thinking, as we tie two ideas together. Humor can play on multiple meanings of a word or a metaphor. As we make the associative connection, we understand the joke.

We can actually train ourselves to improve our associative thinking abilities. There are certain problem types that require us to break convention or logic or literalness to understand and solve.

These are often called insight problems. One type of these problems uses three words and the problem solver is asked to find a word that connects them.

For example: pie, crab, sauce⁴

Often, the solution just comes to the problem solver. He can't identify the process or steps it took to realize the solution. They call this the Aha! Moment (or Eureka! moment). The solution appears as a light bulb being turned on.

The same thing happens when people see the solution for the nine-dot puzzle for the first time. A new connection and an understanding about meaning is made. Actually, we don't have to solve the problem ourselves to have the Aha! Moment. It's a moment when we reorganize our understanding of things, when we discover a new pattern. Solving the problem or even just being given the solution leads us to that new understanding.

Metaphors and Narratives

A metaphor is inherently a false statement. It is a narrative, which ultimately is a substitute for reality and fact.

This narrative, the metaphor, points us toward an underlying truth and propels us on a creative journey to discover truth.

Don R. Swanson, born in 1924, was an information scientist and a former dean of the University of Chicago Graduate Library School. He received a PhD in theoretical physics at U.C. Berkeley and recognized the idea that the discovery (or innovation) process lies in finding links between distinct areas of knowledge and fields, which he called finding "undiscovered public knowledge."

Swanson said, "A metaphor is a peremptory invitation to discovery. What is discoverable are the various allusive ties, or common attributes, between the metaphor and the underlying truth to which it points."

⁴ The answer is apple.

The more associations and allusions the metaphor packs into a single word or short phrase, the stronger its narrative will be. Imagine all the data points connecting the idea of a snake to a stick. Additionally, the quicker we are to grasp all these associations, the stronger the metaphor.

The narratives we used to make sense of the world, the patterns we recognize, are, at the core, just metaphors. They are associations that we link together in and through understanding.

Swiss psychologist Jean Piaget famously said, "To understand is to invent."

Swanson turned Piaget's statement around. He said, "To invent is to understand." To connect associations together, this process of invention and innovation, is the process of understanding and likewise, is the process of the metaphor.

The narrative we create about the world for ourselves is our invention, our understanding.

A child's creative play is often driven by experiments with metaphors. He picks up a stick and calls it a gun; he puts a pot on his head and calls it a hat; he wears dad's shoes and calls them moonboots. He lives through a creative narrative of the world, a fantasy.

"The appeal of the metaphoric act," says Swanson, "lies both in its resemblance to the truth and in the presence of error."

As we age, our metaphors of the world become refined. We even lose sight of them. The narrative (fantasy) blends in with reality and we forget that it is a narrative. We become fully attached to it. This is the scientific method.

This scientific method is a refining process. The real world clashes with our understanding of it and we discard erroneous ideas (hypotheses) along the way. Through this process, we reshape our ideas about the real world over and over again.

Through this calculus of understanding, we might approach an objective perspective on reality, but we can never achieve full and complete understanding.

Associative thinking is a process of exploring connections and links between things; it's a process of finding new metaphors and creating new narratives. We begin life with an unharnessed creative ability to make new connections. As we age, we become attached to certain narratives and find it harder to break free.

Insights are moments when we are able to break free from a previous understanding and arrive at a new understanding. One narrative is destroyed as a new one is created by forming associative links between things in a new pattern.

Aesthetics and innovation

The brain seems wired to recognize or create elegant connections and associations and seems to have the ability to differentiate the elegant from the non-elegant. Researchers have discovered that an

elegant mathematical formula triggers the same parts of the brain as music in functional magnetic resonance imaging machines (fMRI machines).

A pattern is a narrative about all the information it contains. Let's return to Process 1 (gathering information) and Process 2 (making sense of information). Process 1 determines and delivers information and Process 2 creates a narrative for the information.

Making sense is about creating an order in the world around us and in creating a narrative about that world. Narratives are the same as Mandelbrot's "because." They explain why. Part of a good narrative is the aesthetic element. Does it seem to fit the facts easily? The more it fits the bits of data and information we have about things, the more elegant it will generally be and the more it will stand out for us.

American philosopher John Dewey says we experience a childlike sense of innocence in the aesthetic moment. When we synthesize a pattern, we feel the wholeness of it. We experience harmony or *kalos*. Our awareness is not defined by the rational, by analysis, but by a complete, emotional and intuitive understanding. This is the moment of insight, of having a vision, of recognizing truth. This is sensing.

This can occur on a grand scale (when Einstein had a vision for relativity) or on a small scale (seeing a candy bar wrapper on the floor and dog throw-up nearby).

Art and new creations of any type are often appreciated because they compel us to see the world or ideas in new ways. They can push us to consider a new narrative. Like the insight problems, they get us to form new associations that resonate in a meaningful or significant way and generate aesthetic harmony. And like the insight problems, they can get us reorganize our understanding of the world.

This speaks to our ability to dream up new ideas and find or realize elegance where it wasn't recognized before.

We can experiment and create and find new associations and interpretations of the world. We can also do this with problem solving and being drawn to solutions that seem more elegant than other solutions. We are drawn to elegant narratives.⁵

Albert Einstein's theories of relativity were elegant hypotheses that fit his intuitive sense of things.⁶

We want to find simple and elegant explanations for everything, for our business problems, for why some individuals or companies succeed, for why things happened one way or another. We also look for

⁵ Nassim Taleb reminds us that elegant narratives can be deceiving. Just like we believed the narrative of the snake to explain the data of the stick, we also have a human tendency to believe any elegant narrative that is loosely tied to the facts. Taleb warns us to beware of narratives from expert story tellers (financial advisors, political pundits, economists, sports analysts). Each of them is an expert at laying out an elegant narrative over a complex system, where narratives are to be taken with a heavy grain of salt.

⁶ John Dewey said of Einstein: "I suppose anyone who knows Mr. Einstein at present would say that he had quite as genuine and esthetic an experience from his mathematical calculations and their results that would mean nothing to us as he does from playing the violin."

elegance in our search for new patterns. To us, the roots of creativity, pattern recognition and innovation emerge from the same fabric that creates metaphors and links associative ideas and gives us a sense of aesthetics. These are the foundational elements that dynamic capabilities draws upon when we try to sense new opportunities and threats in changing, volatile markets, and put ourselves in a position to react quickly to those uncertain and rapidly changing environments.

The patterns and narratives of the world are both truths and false truths. They provide us with meaning and understanding (a truth about things) and yet, they may be false. They rarely can account for all variables and are selective (by the narrator's choice or by our cognitive biases) as to what bits of information they choose to highlight (a.k.a. the so-called facts).

But, when we're looking for patterns, trying to make sense of information, as part of the sensing process, we can find truths in the patterns. Even if these truths turn out later to be false truths, they can give glimpses of possible futures. The thing about becoming visionary is that the patterns we recognize and use to explore possibility are highly speculative and uncertain. Nonetheless, we can get better at recognizing patterns and exploring possibility. We just need to keep in mind that what we may deem to be the truth in our observations today may not be true tomorrow. This is part of the scientific method. We'll talk more about the scientific method when we meet Charles Sanders Peirce later in the chapter. Truth has both an absolute wholeness about it and still is transitory, as our perspective and understanding change.

Chapter 6: Becoming Unprepared (Unlearning)

John Cage was an experimental composer born in 1912. He was a leading figure of the post-war, avante-garde movement. Like many artists, he constantly challenged his understanding, his own expertise. He questioned the very nature of what music was or what it could be. He said of himself, "I'm trying to check my habits of seeing, to counter them for the sake of greater freshness. I am trying to be unfamiliar with what I'm doing."

Every executive might take Cage's words to heart.

If you want to see better, to sense, to be able to see around corners like Jack Welch, you need to put your habits in check. Unlearn what you know. Try to overcome some of your cognitive biases, such as the framing effect (as we saw with the 9-dot puzzle), in order to see reality better and then, try to look forward and extrapolate possible futures.

This is not about data analysis. This is about opening up to possibility. This is about synthesizing the whole. It's about becoming visionary. It's about discovering truth.

Creativity and brain scientists John Kounios and Mark Beeman have used functional Magnetic Resonance Imaging (fMRI) machines to look at the brains of subjects doing insight problems. They found that the temporal lobes of the brain light up significantly more when people are solving insight problems as opposed to using analytical problem solving skills.

In their book, *The Eureka Factor: Aha Moments, Creative Insight, and the Brain*, they said the difference for someone in an insightful frame of mind is that "everything is up for consideration." They continued, "Nothing is off the table. Any idea--every idea, no matter the source--is considered a potential solution. That's why both the left and right temporal lobes light up like a Christmas tree when a person adopts an insight mind-set. It's the neural manifestation of openness..."

Sensing the future, sensing the possible starts by becoming open to the possible, by setting aside our attachment to current patterns and ways of understanding, and then, by recognizing the many human biases that surround us and our organizations.

Let's return to all those executives in Detroit again.

We asked this question earlier: *Why did every last CEO and senior executive in the automobile industry over the last 15 or 20 years miss a shift in their own market?*

Blindspots, the improbable, and the logic of white swans.

Those executives didn't take the external threats seriously.

Why do we have these blindspots to reality? Lots of reasons. Many of these reasons come down to cognitive biases that shape the way we see and interpret and act in the world.

These biases affect the narratives we create about the world for ourselves and influence the patterns we see in the world.

Amos Tversky and Daniel Kahneman discovered these nearly universal biases in 1972. Kahneman later won the Nobel prize in Economics studying cognitive biases and developing the field now known as behavioral economics. These cognitive biases are caused because people create their own subjective social realities based on their perceptions and limited perspectives of the input, how they perceive the world.

Many cognitive biases are self serving and self directed. They can also affect culture at the macro level and create prejudiced values.

Many of the Detroit executives, as well as members of the various intelligence branches in 1941, were subject to some level of confirmation bias, giving extra weight to evidence that supported their beliefs and discounting evidence that didn't. Detroit executives believed that consumers weren't interested in electric cars. They also believed that consumers had an inherent need to own an automobiles, which dates back to the 1950s suburban movement. Likewise, military and intelligence officials, such as Commander Arthur McCollum, overweighted the evidence consistent with opinions that the Japanese wouldn't attack Pearl Harbor and discounted the evidence supporting a possible attack.

Perhaps, they were also influenced by overconfidence bias and an anchoring effect. There are more than 170 recognized cognitive biases.

Every one of us experiences many cognitive biases each day and these distort reality. They aren't all bad. They help us function in society and socially with one another. They help us make sense of things. They give us cause and effect answers, they help us to believe in "because." Without them, our sanity, everyone's sanity would be in jeopardy. The downside is they make us complacent in the face of reality. They blind us.

Sydney Finkelstein, Jo Whitehead, and Andrew Campbell, in their book *Think Again: Why good leaders make bad decisions and how to keep it from happening to you*, categorized biases into a typology of five bias types, at least as they pertain to executives:

- **Action-oriented biases**

Excessive optimism, overconfidence and competitor neglect.

- **Interest biases (agency problems)**

Misaligned individual incentives, inappropriate attachments and misaligned perception of corporate goals.

- **Pattern recognition biases**

Confirmation bias, power of storytelling, management by example, champion bias, false comparisons.

- **Stability biases**

Anchoring effect and insufficient adjustment, sunk-cost fallacy, loss aversion, status quo bias

- **Social biases**

Groupthink, Sunflower management

This list, while not exhaustive of the many biases that can affect employees and executives, is a good starting point in understanding the psychological forces that influence both our awareness (making sense) and our decision making.

When we think of the Detroit executives (or Fortune 500 executives for that matter) and their blind spots, we cannot ignore the homogeneity of their backgrounds. They were all trained in the same institutions and business schools. For the most part, they all have the same backgrounds. This was also the case with the meltdown in the financial sector in 2008. They all buy into the same ideologies about how the world works, how business works. They surround themselves with people who have similar backgrounds and outlooks.

The groups that form at the tops of organizations are rarely diversified in any meaningful way. This lends itself to organizational- and industry-biased mindsets. It leads to GroupThink and Sunflower

Management and other social and organizational biases. It leads to massive blind spots and failure on a global level like we saw with the financial crisis that led to one of the worst recessions in history.⁷

The early technology startups in the 1970s and 1980s were made up of engineers, writers, artists, dancers and musicians. They bonded by creating music and art together at night and by working on problems together during the day. They imagined futures together and they engineered possibility. This was the Zeitgeist. They were a corporate counter-culture. Many startups today still embrace this counterculture attitude, but too few firms understand the importance of true diversity at the top. This leads to a focus on normal capabilities, such as best practices, rather than on dynamic capabilities, such as insight and possibility.

Large firms can benefit from exploring ways to create greater diversity among their leaders. Putting together a bunch of MBAs who largely have the same training is not diversity, no matter where they went to school. Diversity is about bringing together people who think differently, whose backgrounds are more different than they are alike. This notion of diversity is a common theme in this book. Teams that can sense new patterns or possibility, or that can lead firms to prosperity, not only require diversity, they feed off of diversity and succeed because of it. Later in this chapter, we'll talk about the economic matrix and how diversity is one of the major driving factors in the economy.

Charles Sanders Peirce and creative insight

Charles Sanders Peirce was a Harvard-trained philosopher and mathematician, who is now considered the father of pragmatism. He was born in 1839 and was a child prodigy. He wrote a history of chemistry when he was 11-years old and read his older brother's books on logic when he was 13. He could write with both hands, writing a problem with his left hand and its solution with his right hand, simultaneously.

Despite his talents, he got bored easily, drank and womanized. When he graduated from Harvard in 1859, he ranked 79th in a class of 90 students.

His efforts to land an academic position at Harvard were thwarted because a former professor of his, who later became president of Harvard, didn't like him and repeatedly interfered with any attempt to hire Peirce.

He lived largely in obscurity and lapsed into extreme poverty at the end of his life.

Peirce came up with the idea of abductive reasoning as one part of a three-part scientific method: abduction (hypothesis), deduction (conclusions are drawn if the hypothesis is assumed to be true), then induction (experiments are carried out to test the hypothesis).

⁷ The same holds true for the world's leaders. Many of them were trained at the same seven or eight universities. This gross imbalance is dangerous for humanity.

Peirce developed abductive reasoning as a way to conceive of possible explanations when information was incomplete, when some level of uncertainty existed. For example, a medical diagnosis is a form of abductive reasoning, taking the known evidence and applying a diagnosis while understanding that what we know is incomplete. This process of reasoning doesn't guarantee that the conclusion is correct, but it presents a likely possibility, from which we can project scenarios into the future.

Albert Einstein used abductive reasoning to develop his two theories of relativity. It's the process of taking the known evidence and using creativity and insight to find possible and likely explanations and new patterns of understanding.

German scholar Jo Reichertz noted, "Abductions ... always aim at one thing: the achievement of an attitude of preparedness to abandon old convictions and to seek new ones....It is a state of preparedness for being taken (in an) unprepared (state)."

Reichertz echoes composer John Cage, in preparing ourselves for the new by entering a state of being unprepared, cutting ties with what we think we know, with our assumptions, becoming unfamiliar with what we're doing. By putting ourselves in this open state of mind, we can become receptive to the possible, to the future.

Abductive reasoning and creative insight can help us explore possibilities based on observed cues from shifting markets, new technologies, changing customer behaviors, global political regulatory changes and many other areas.

Open Minds

Charles Peirce and John Cage both pointed toward the importance of approaching information and the future with an open mind and eliminating our preconceptions and biases at the outset.

This state of mind attempts to dismantle the associations we already have about the world. We want to separate the metaphor (our conceptions and assumptions about the world) from the real world, from the information and data that can be observed.

This process of sensing, from dismantling our associations to re-organizing information into new patterns that may give us new and enlightened perspectives on the future is at the core of dynamic capabilities. We use dynamic capabilities to become visionary and agile, to sense possibility and then to act on that possibility quickly.

Chapter 7: Sensing and Organizational Integration

Sensing, in the dynamic capabilities framework, is more than just learning how to see or how to improve our associative thinking abilities. How do we integrate sensing routines and activities into the organization and foster values that support a dynamic sensing mindset and culture.

Further, sensing isn't a role exclusive to the chief executive or senior management. Sensing is about recognizing patterns. The more points of information that interact, the faster a pattern may appear that will point to a market opportunity or threat.

This is partly why "flat" organizations seem well-suited to recognize and take advantage of opportunities sooner. Information can have many touch points in a firm and any of those touch points may recognize a pattern emerging. Flat organizations are less constrained by bureaucratic hierarchies and can move quicker into and out of markets. Complexity theorists say complex systems are typically self organizing and rely less on linear inputs and outputs. A flat organization approaches this type of organizing behavior, albeit organizations cannot become completely self organizing as they require some structure, routine and executive decision making.

Design thinking has formalized a group problem solving process, where teams are constructed to include a diverse set of personalities and backgrounds. By interacting along many points of the problem or situation, each person brings a unique perspective. The overall group, however, gains a broad perspective and is in a better position to recognize patterns and find possible elegant solutions that any one individual would be incapable of developing. (See sidebar on Design Thinking/IDEO)

One major difference between design thinking and firm-level thinking is scale. It's one thing to get a team of five, 10 or 15 people to self organize without hierarchies and to work on a problem and it's another thing to integrate firm-wide processes and attitudes to attempt to accomplish the same goals.

It's just not feasible because communication can be slowed by friction, silo'd communities and lines of business, cultural attitudes and countless other factors inside a large firm. Plus, large groups can create a lot of noise, which will make deciphering harder.

Researchers have found that the size of a firm and inertia are positively correlated, meaning the larger the firm, the more inertia it exhibits. This is a problem for firms that want to be agile and move quickly on opportunities.

Some firms, however, have successfully integrated input across their organizations for well-defined, short-term goals. IBM did it when it held a company-wide ValuesJam to come up with new guiding values for the firm.

In 2003, IBM CEO Sam Palmisano initiated a three-day company-wide forum called ValuesJam to develop new company values. The old values had been established in 1914 by Thomas Watson Sr., the founder of what became IBM. They were:

- Respect for the individual
- The best customer service
- The pursuit of excellence

Even though these values helped build and define IBM, over the years, they had become associated with internal arrogance and a sense of entitlement. Palmisano wanted employees across the organization to participate in developing new values and in the process, to become re-engaged with the firm.

As the forum got underway, the initial response was characterized by cynical comments like, "The only value in IBM today is the stock price." Other comments pointed to some inherent cultural problems, but were equally cynical: "I feel we talk a lot about trust and taking risks. But at the same time, we have endless audits, mistakes are punished and not seen as a welcome part of learning, and managers (and others) are consistently checked."

By the second day, the tone had shifted and the comments were more engaged and while many were still critical, they were constructive and hopeful.

During the three-day forum, over 50,000 comments were posted about IBM's values, what they were and what they could become. IBM used software to analyze the comments for trends and themes. Many pointed to a lack of trust and an internal dysfunctional culture. After the analysis, a small team developed a new core set of values that addressed the culture and invited IBM to engage and unite internally:

- Dedication to every client's success
- Innovation that matters--for our company and for the world
- Trust and personal responsibility in all relationships

The process of inviting the entire organization to help create and define new values also engaged what had been an unengaged, territorial workforce where business units and teams had built walls to protect their own interests against other units.

Engaging employees across the company can help break down barriers between business units and eliminate silos of information.

Firms that are made up of highly segregated business units will often be slow to sense opportunities and threats and slow to react. There are exceptions when those business units have autonomy to make executive decisions about their markets. But generally, these would be the exception.

Values and employee engagement are key ingredients to the agile firm.

Frontline workers

Frontline and customer facing employees are critical to sensing changing customer behaviors and also in sensing new customer needs.

Unfortunately, frontline workers rarely have reliable channels for sharing information or their insights across the firm and even when they do, they might not be emotionally committed to the firm's values and culture, which are two of the main driving factors in how engaged they are in their jobs.

William Shakespeare's King Henry V gives us a lesson in leadership on the frontline and in sensing. On the eve of the battle of Agincourt, King Henry disguises himself as a common soldier and walks from campfire to campfire to get a sense of his troops' state of mind, to sense their readiness and morale.

Are they ready for battle? Do they support the mission? As he talks to his soldiers, he finds they aren't fully aligned.

The following morning, he gives his famous "Band of Brothers" speech down amongst the troops. He does the unspeakable for a King, calling them his brothers, his equal. He points to their higher purpose, beyond each of them individually, that together, they can realize greatness. He unifies their purpose together.

David Packard used this method at Hewlett Packard in walking among his employees, gauging their insight about the business, talking with them, getting to know them.

This is a leadership lesson in morale, but it's also a lesson in sensing. What's going on in your company? What do the front line workers see? What do they think about your corporate mission. Do they sense any changes in customer behavior or needs? What do they hear from the customer?

On the eve of any battle, gauging your troop's readiness is critical. In a world that's in perpetual motion, those front line workers might be the first to sense a significant change in the market. They might recognize a pattern before anyone else. Executives and managers should talk to them, walk among them, not only to boost morale but to tap their insight and views on the world, to see what they see.

Executives (and kings) who stay in their ivory towers will become disconnected from their people and the world outside. This will lead to lapses in information, bad decisions, and ultimately, organizational failure.

Sensing and organizational culture

Both the IBM ValuesJam case earlier and David Packard walking among employees at Hewlett Packard underline the importance of organizational culture.

Companies need everyone's buy-in in order to become good at sensing. Executives have to rely on their managers and frontline employees to share information in order to sense possible threats or opportunities. Employees are an executive's eyes and ears to the world outside the firm.

In an organization that has a dysfunctional culture, either those employees won't share much of what they see and hear or worse, their opinions will be skewed by their attitudes toward other employees, other business units, other managers, directors or even their opinion of the firm's values.

How can an executive nurture a culture where people will care about and be sensitive to subtle market indicators and be willing to share openly across the organization. There's no silver bullet here. Culture takes continuous nurturing. It starts by hiring the right people, people who already share many of the firm's values.

Résumé metrics can rarely uncover a prospective employee's attitude about the firm's culture. Measuring experience tells the executive nothing about a person's ability to fit in and contribute to the company's positive chemistry.

Building the right culture starts with hiring the right people. It's often better to hire someone who is less qualified but offers a better long-term fit with the organization's values and culture. Training someone how to do a job is infinitely easier (and cheaper) than trying to change someone's attitude.

The best organizations align their values with everything they do. If a firm doesn't treat its values with supreme reverence, none of its employees will either.

An executive who wants to build an agile, sensing firm starts with developing core values and hiring people who buy in, who have the capacity to be fully engaged.

Sensing processes and attitudes can be integrated throughout the firm in its procedures, corporate governance, values and culture.

Sensing isn't an isolated activity. It's an integrated aspect of what the firm does, how it acts, how its people think and socialize, how information is shared and used. Some would call this knowledge management, which it includes, but it goes beyond knowledge management. It's also about the firm's holistic identity.

Along with gathering information, the sensing function in the firm needs to make sense of its observations. This is often a strategic function. Some firms have mistakenly put scenario planning and other forward looking functions into the risk assessment groups. The problem is one of framing bias. Those groups tasked with assessing risk will often focus too heavily on threats and ignore opportunities in the patterns they recognize.

We recently talked with several chief strategy officers whose Fortune 500 companies made this mistake and they have since moved their sensing functions from a risk assessment group to the strategy group within the firm.

Chapter 8: What are we looking for?

When we're looking for patterns, we don't always know what we're looking for. It may be a shift in consumer behavior. It may be a new business model or process. It may be a potential market that can be created by extending an existing product or merging two ideas or products in a novel way. It may be a technological change that is working its way into our homes and lives or that creates a new business model to disrupt an old market.

There are countless ways that the world and our firms can be transformed, so we can't necessarily know what we are looking for at the tangible level.

But we can know what we are looking for at the abstract level. We are looking to find a new pattern that we haven't seen before, a strong enough and novel enough pattern that stands out in some significant way.

Often, the new pattern emerges at once as an insight, typically when some small bit of arbitrary information (a last puzzle piece) brings the whole into focus. We never know where or how that last puzzle piece will present itself.

But we can't look exclusively for the last puzzle piece because the entire pattern won't become visible until it's found and all the parts interact and speak as one.

We'll discover new patterns through seemingly arbitrary or unrelated bits of information coming together.

We are looking for patterns that suggest the possibility of entirely new markets and industries. These patterns may be realized as threats or as opportunities. Detroit failed to recognize the behavioral changes in Millennials, who increasingly differentiated between transportation and ownership. Detroit had treated cars as possessions since the beginning and transportation became a forgotten value. The perks (and luxury) of ownership was the core focus. Southwest Airlines eliminated all the frills of travel to provide low-cost air travel. Likewise, Uber and ZipCar and Lyft and others have eliminated the high costs of transportation ownership and replaced it with transportation as a service.

When looking for patterns in all the information, when trying to become a visionary, look for emerging behaviors or where markets might be failing. Detroit was failing for Millennials. While Millennials may not completely forego owning an auto, families may opt to keep a single vehicle instead of the typical two vehicles that earlier generations owned. This amounts to a shrinking market for Detroit.

W. Chan Kim and Renée Mauborgne's bestselling book, *Blue Ocean Strategy*, argued that we should stop trying to compete for market share with our existing competitors and look for new, uncontested markets, which they call blue oceans.

This is a key area to search. We may see that a new business model or changing consumer behaviors have created a blue ocean.

Executives should look at the fringe of their industries or even completely outside their industries for areas where new markets could pop up. It's difficult to predict new markets or blue oceans, but we can draw on a wide range of tools to give us a better shot at sensing those opportunities (or threats).

We're also looking for ways to extend our existing business capabilities and technologies into new markets, either newly created ones (blue oceans) or existing markets that might be ripe for disruption (Google, Tesla and Detroit), which will create a blue ocean when it is disrupted.

Whatever we're looking for, we'll recognize it as elegant and important in some way when it materializes as a pattern. This pattern will appear as a hypothesis that can only be tested in the context of the market.

George Lucas, categorical mindsets and sensing a new business model

In 1967, the film *Doctor Doolittle*, based on a hit children's book written during WWI about a veterinarian who could talk to animals, was nominated for nine Oscar awards. This was the culmination of an unprecedented marketing and merchandising campaign.

Despite the Oscar nominations, Twentieth Century Fox's film became legendary for two reasons: It was one of the biggest box-office flops in history at the time and the film is remembered largely for its aggressive marketing campaign aimed to secure Oscar votes from members of the Academy of Motion Picture Arts and Sciences.

The marketing (and merchandising) effort began once the studio secured the rights to the film in 1964. The studio wanted a big budget musical for 1966 to follow *The Sound of Music*, which was going to be released in 1965.

Advertising and merchandising for the movie started as early as 1964. More than 300 merchandising products flooded the market before the film was released. Dell re-released the children's novels. Aurora produced model kits of both Doctor Doolittle and Pushmi-Pullyu, a two-headed llama that's in the film. Mattel created talking dolls, a giraffe-in-the-box and other toys. Purina offered kids a free animal figure when they sent in proof-of-purchase coupons to the company.

It was the sort of marketing and merchandising campaign that's commonplace and expected in today's media-centric culture.

The merchandising and marketing worked hand in hand to create pre-emptive awareness (hype) for the film and built up momentum in the studio's efforts to sway members of the Academy of Motion Picture Arts and Sciences to cast their Oscar votes for the film. The studio went so far as to wine and dine members of the Academy of Motion Picture Arts and Sciences to secure votes.

The strategy paid off initially with a basket full of Oscar nominations, including Best Picture. The film, however, was a critical and commercial flop. The film lost \$10.8 million (\$77 million in 2016), and the merchandisers were left holding over \$200 million in unsold goods. This colossal failure was a warning throughout Hollywood about merchandising and would be remembered by 20th Century Fox just a few years later.

In May 1973, several months before George Lucas would become famous with the release of *American Graffiti*, he had written a 13-page proposal for a Flash-Gordon like sci-fi film. The proposal began, "the story of Mace Windu, a revered Jedi-bendu of Opuchi who was related to Usby C. J. Thape, a padawaan learner to the famed Jedi." It was indecipherable to anyone who tried to read it, including his own agent and lawyer.

Nobody could understand a word of Lucas' 13-page plot summary and certainly, no one thought it would be a blockbuster hit. An executive at 20th Century Fox, Alan Ladd Jr., took a chance on Lucas after seeing a screening of *American Graffiti* (before it was released).

He offered Lucas \$25,000 to write and \$50,000 to direct *Star Wars*. All other points would be negotiated before the film was released.

A few months later, in August, *American Graffiti* was released across the country. It cost \$1.27 million to make and made \$55 million at the box office. Lucas's stock went through the roof and gave him the opportunity to renegotiate his deal with 20th Century Fox.

His agent Jeff Berg, a UC Berkeley grad, told him he could get a \$500,000 salary. Instead, Lucas wanted ownership of the movie. He wanted to own its intellectual property, including the merchandising and sequel rights.

Lucas had just finished *American Graffiti*, which was largely about his own childhood, cruising up and down 10th and 11th streets in Modesto, Calif., and had to acquiesce to the studio's cuts and vision. He didn't want to give up ownership on a film again. This mindset likely led to insights about the full range of opportunities within the property rights to *Star Wars*.

The studio thought it was a great deal, not having to pay Lucas a huge salary and giving up very little. After the failure of *Doctor Doolittle*, the prevailing mindset in Hollywood and particularly at 20th Century Fox, was that merchandising was mostly a form of marketing and on its own, was worthless. Dale Pollock, in his book *Skywalking: The Life and Films of George Lucas*, said, "(It) took 18 months to get toys designed, manufactured and distributed; by that time, a film had usually disappeared from theatres."

Plus, no one could understand Lucas' plot summary and certainly, no one thought it would be a blockbuster hit.

The industry (and in particular, 20th Century Fox) was caught in a categorical mindset (perhaps industry-wide Sunflower management bias) about merchandising as marketing, a cost center.

Twentieth Century Fox couldn't believe its luck. Lucas didn't ask for a \$500,000 salary, only certain intellectual property rights to the brand, sequels, merchandising and other items that were considered small change to the studio.

For Lucas, this turned out to be a \$4 billion insight. And it changed Hollywood forever. The idea that merchandising can be an integral part of a profitable business model wasn't realized until Lucas changed the paradigm. He discovered an industry bias and found a blue ocean.

One of the things about sensing is that outcomes are not known. Lucas didn't know that *Star Wars* and its sequels, including the merchandising, would transform the movie industry.

We never know how things will turn out. The biggest successes are often far bigger than anyone ever imagined. Facebook and Twitter were both provincial in nature. Facebook was a tool for Harvard kids to share photos and updates with each other, and Twitter was essentially a means for internal doodling among the staff at a small startup. These weren't serious ventures with a vision of greatness, but they became so.

Of course, we shouldn't forget that some of the biggest visions and projects turn out to be monumental flops, as was *Doctor Doolittle*.

Discovery in the value chain

Nintendo was formed in 1889 and produced illustrated playing cards with animals and flowers on them. The Nintendo name comes from three Japanese Kanji characters: nin, ten, do. David Sheff, in his 1993

book, *Game Over: How Nintendo Zapped an American Industry, Captured Your Dollars, and Enslaved Your Children*, said the name meant, "Work hard, but in the end, it is in heaven's hands." The cards were widely used in gambling.

The company ventured into new areas as it evolved. When the founder's great grandson took over in 1949, the company landed a licensing agreement with Walt Disney to put Mickey Mouse on playing cards, which was a big success. But the company experimented and suffered a few failures over the years as well: instant rice, the taxi business.

In the mid-1970s, during the dawn of video games, the company saw what Atari was doing in California and wanted to chase them into the video game business. Arcade games like *Pong* were just making their way into the home and *Space Invaders* and *Asteroids* were hits in the gaming arcades. At the time, Nintendo was making cheap gizmos and trinkets like what Nick Paumgarten described in a 2010 *New Yorker* article, the Ultra Hand, "a device with a gripping hand."

Shigeru Miyamoto joined Nintendo in 1977 as an artist after showing the company a few toys he'd made, including some wooden clothes hangers shaped like animals for kids. Miyamoto was 24-years old, just out of art college, where he took an interest in manga. He grew up reading manga and went to college to create his own Japanese comic strips.

In an attempt to enter the North American video arcade market, Nintendo created a game called *Radar Scope*, but the game flopped in the United States and Nintendo was left with 2000 unsold *Radar Scope* machines. The company asked Miyamoto to design a game that could go in the existing *Radar Scope* cabinets.

He came up with *Donkey Kong*, which was loosely based on three popular film and comic strips: the 1933 movie *King Kong*, the *Popeye* comic strip and animated cartoons and the *Beauty & the Beast* fairy tale. *Donkey Kong*, which scrolled from left to right like a comic strip, was the first game built around narrative and playfulness. Until then, narrative wasn't of much interest to game designers and was only added as an afterthought. The narrative was based on the idea of a love triangle between a guerilla (King Kong/Bluto), a protagonist (Popeye) and a girl (Olive Oyl). Kong would kidnap the girl Pauline and take her up to the top of the steel structure and Jumpman, later named Mario, would climb the structure to rescue her. Nintendo had attempted to secure rights to *Popeye* previously but failed. So the company created its own characters using the same archetypes and the damsel-in-distress story line.

Donkey Kong essentially saved Nintendo, which was on the verge of collapse after *Radar Scope* flopped. In the first year, 1982, Nintendo earned \$180 million from *Donkey Kong*.

Miyamoto went on to develop iconic video games like *Mario Bros*, *Super Mario Bros* and *The Legend of Zelda*.

Videogames became more graphic intensive and complex from the 1980s through the late 1990s and early 2000s. Four companies, Sony, Sega (which coincidentally like Nintendo got its start in gambling with slot machines in Hawaii during WWII), Microsoft and Nintendo. The four companies went head to

head with competing game consoles targeted at 14-35 year-old males. Many of the games were action packed or built on complex story lines and strategies. The gaming largely took place in dark bedrooms and basements.

Sega shifted out of the gaming console market and focused on creating games (software) for other consoles in 2001. That left three companies to compete for a spot (sometimes it was just one spot) in teenagers' bedrooms and bachelors' basements.

Miyamoto and Nintendo chose to go in a different direction rather than continue competing for its share of an established market, where margins were shrinking and the cost to maintain market share was increasing due to increasingly expensive hardware, software and marketing costs.

They wanted to go after the casual gamer, not the hardcore gamer. Additionally, they wanted to create a product that would bring gaming out of the basement and into the family room.

In 2006, Miyamoto and Nintendo created a wireless console with built-in motion sensors that would capture hand and arm movements. The controller could be swung like a tennis racket, rotated like a steering wheel or pointed like gun. The Wii had less processing power and lower-end graphics than Sony or Microsoft.

Miyamoto told *Business Week* in 2006 when the Wii was released, "The consensus was that power isn't everything for a console. Too many powerful consoles can't coexist. It's like having only ferocious dinosaurs. They might fight and hasten their own extinction."

Miyamoto's words echoed the sentiment of Kim and Mauborgne's *Blue Ocean Strategy*, where companies competed in blood-filled red oceans. Blue oceans were a metaphor for new, unclaimed, wide-open markets.

Miyamoto wanted a game console that cost \$100 or less. At the time, Microsoft and Sony machines cost north of \$300 and relied on expensive processors and hardware. With the Wii, they placed their bet on the idea that a fun game was more important than graphics. Ultimately, the Wii sold for \$211.

"Our goal was to come up with a machine that moms would want," Miyamoto told *Business Week* when Wii was released, "Easy to use, quick to start up, not a huge energy drain, and quiet while it was running."

The Wii became a sensation and brought gaming into the living room, where families could compete in tennis, bowling and other "social" games as a family.

Nintendo's revolutionized gaming for a second time (the first being the narrative and cartoon-like graphics in *Donkey Kong*). They sensed the importance of mom's role in buying video game consoles and also the idea that video games could be a social endeavor.

Miyamoto told Paumgarten and *The New Yorker* that the early manga artists he loved in his youth later turned the genre upside down. "When they became much older, they started to destroy the style they

themselves had created," he said. They moved out of the cartoon-panel framework, developed complex, multiple narratives.

"When I started working for the company, I thought that someday I would like to do the same. I wanted to destroy the styles that we ourselves created. I don't think we can do so completely, but I think that in the way that we are making video games today we might be getting closer to my idea of destroying the original style."

This process of subverting and destroying is what entrepreneurs do. It's called "creative destruction." They recognize an aging market or product and see how the market has shifted. They envision new products that could speak to the market better. They recognize that the original could be undermined and replaced. They see its shortcomings or rather, its full potential reaching its peak and having nowhere else to go. The Wii subverted the basement gaming culture and the ultra-sophisticated graphics and expensive consoles, developing an entirely new market through moms and the entire family from three-year olds on up centenarians.

Miyamoto's creative destruction illustrated the dynamic capabilities framework (transforming, sensing, seizing). The idea was to transform their company and product in order to stop fighting like dinosaurs for a limited market, then sense how a new gaming product could be used and adopted by the consumer. And finally, they seized the market by targeting moms and families with a more affordable, easy to use console.

The end-users, the gamers, were only part of the value chain. Mom made the final purchasing decision, just like she does with cereal. Kids certainly influence those decisions, but mom gets out the credit card or checkbook to make the purchase. The Wii catered to mom and found a new market.

Nintendo and Miyamoto recognized the role that mom played in the purchasing decision and also recognized that along with price, mom might value features like how loud the machines were (no fan) or how many wires there were. Finally, they recognized mom as a conduit to a new, broader market of casual gamers. If mom bought the Wii and it was set up in the living room, not the basement, it might be embraced by the whole family.

Accidental Discoveries

Recognizing new patterns may be accidental. In fact, it's often accidental or serendipitous. Nintendo recognized mom's role in the value chain and then discovered an entire market of casual gaming when their consoles were brought up from the basement into the living room.

George Lucas's negotiations with 20th Century Fox were serendipitous because he arrived when they had just swallowed a bitter pill following the flop of *Doctor Doolittle* and its disastrous merchandising and marketing push that left their merchandising partners (Mattel, Aurora, Dell, etc...) with thousands of unsold records, dolls, stuffed animals and books.

We don't know how we'll stumble upon new ideas or how the market will react to our efforts.

The drug compound Sildenafil was created in the early 1990s to reduce blood pressure. In 1992, Pfizer filed a patent to market it as *Revatio*. During trials of the drug, Pfizer also found that Sildenafil had a secondary use, which would eclipse its use as a blood pressure medicine and would become one of the biggest drug successes in the last 50 years. Sildenafil was patented a second time in 1994 to treat erectile dysfunction and was marketed as *Viagra*.

Many of the best business ideas in history were accidental discoveries.

Some firms are starting to revisit the slush pile of discarded ideas. We talked to one Fortune 500 firm that hired a person to go through every discarded idea and initiative from the past 30 years, looking for a hidden gem. Maybe he'll turn up an idea that was before its time.

If he's able to frame those old ideas within a modern context, which may reveal something that was previously hidden. They may fit a pattern and serve as a solution to some problem.

Chapter 9: The Visionary Matrix

The Economic Matrix

Stuart Kauffman is a theoretical biologist and complex systems expert at the Santa Fe Institute in New Mexico. He's written articles and books on biology, economics, management and the origins of life from a complexity perspective.

In his book, *Reinventing the Sacred*, Kauffman describes economic growth as a matrix of evolving relationships. Primitive man perhaps had between 100 and 1000 products and services that were exchanged among them. Today, we have approximately 10 billion products and services. Each of these goods is related to a multitude of other goods within the entire web of goods. Imagine a large visual matrix with strings running from one good to all the other products and services that may have a relationship with it. This is Kauffman's economic web of goods.

For example, a screwdriver may be a product for driving screws, so it would have a complementary relationship to screws. Likewise, it would have a substitute relationship with a hammer and nail. Other uses might be to scrape paint or as a weapon. The uses for a screwdriver may not have all been discovered yet.

Most products enter the market as a substitute or complementary product. Over time, a product or service may find other uses beyond the one from which it was born. Each of these other uses is part of the creative economic engine of growth. We find new ways for goods and services to be used or for them to provide value to our existence.

Additionally, each new usage of an item may extend the economic matrix with additional products and services that are born out of the newly created area of the web. Old products and services may reach the end of their lifecycles as new products and services displace our need for those old goods. The buggy

and horse were displaced by the automobile. At the same time, the auto helped create an entirely new and expanded matrix of complementary products and services, such as gasoline, gas stations, auto repair shops, and paved roads, to name a few.

This 10-billion-product matrix is growing and evolving every day. Each new product plays a minor role in a much larger matrix of substitute and complementary goods or may open entirely new areas for technological and economic expansion. These would be called blue oceans by Kim and Mauborgne.

Dynamic capabilities is a management and strategic framework that speaks about our ability to be an actor within this expanding and evolving economic matrix. We sense opportunities by recognizing the ways that a product or service may interact with other products and services, or be used in new, novel ways. We may see a novel application of a product that opens up an entirely new branch of economic growth (a blue ocean). Or we may combine products (technologies) together in a novel way to solve a new problem.

Pfizer's Sildenafil started as a substitute product to treat certain heart conditions and allergies. The researchers at Pfizer noticed that in the trials, one of the side effects was an increased libido. By exploring this tangent, by opening this door, Pfizer discovered a new market application for Sildenafil to treat erectile dysfunction and in the process, launched a huge new market in a blue ocean.

Play-Doh, likewise, was developed as a substitute product to clean wallpaper from all the soot buildup when people warmed their homes with coal and wood burning stoves.

Most products that served as a catalyst to economic market awakenings began as substitutes or complementary products in wholly unrelated markets. Someone, the discoverer or visionary, was able to draw a new line, discovering a relationship, to a new use for the product or service. (See sidebar, *Evolution of Technology*.)

In sensing, in looking for a newly revealed patterns, we're looking for ways to connect existing products and services with external problems or changes in human or market environments. Sensing, in the dynamic capabilities framework, is about our ability to recognize possible connections within Kauffman's economic matrix of all existing goods.

We talked earlier about recognizing new patterns. The patterns we see may relate back to an economic relationship and that's where we'll find those opportunities or even recognize potential threats to our industries.

Kauffman's economic matrix is presumed to be growing and evolving. The more diverse the mix of products in the matrix, the more new connections appear among and between them.

An increasingly diverse mix of products in the economic matrix will lead to exponential growth as new connections across the web lead to more discoveries and connections.

Specialists and Generalists

The best way to see new possibilities within the economic matrix or discover new patterns is often to bring together as many diverse perspectives as possible. The economic matrix has limitless possible combinations of relationships between products and services. Our ability to see across a broad section of the matrix improves as we gain a more diverse and broader perspective. This is the realm of generalists, not specialists.

Being a specialist in an industry allows for a deep level of hard to duplicate expertise. The downside for the specialist is that his view can be fairly narrow, so recognizing broader patterns becomes much harder.

The difficulty for organizations is that many of them focus their hiring on specialists and niche experts. This makes sense. These experts can perform very focused functions efficiently and can provide subject matter expertise to help a division or business unit perform. Experts are needed in a company's normal capabilities framework.

Executives want the best engineers to build products; the best data scientists to analyze information. They want the best attorneys to develop patents and other IP strategies. They want the best programmers to write code for their applications. They want the best sales and marketing people to expand their businesses and grow the bottom line. They want the best accountants to minimize costs and taxes. Without experts, businesses would deliver poor products to the market and run inefficiently. Specialists are key to productivity.

At the same time, when trying to look out at the horizon of possibility, experts can suffer from near-sightedness. They aren't able to integrate a broad range of perspectives from within and outside their industry or specialty.

The Hedgehog and the Fox

In 1953, Livonia-born (present day Latvia) and Oxford-trained philosopher Isaiah Berlin wrote an essay about writers and thinkers, dividing them into two personality types, Hedgehogs and Foxes, which he drew from the Greek poet Archilochus. Archilochus said, "The fox knows many things, but the hedgehog knows one big thing."

Berlin said hedgehogs (specialists) related everything to one central vision, a single organizing principle, while foxes (generalists) connect many principles and ideas without an underlying principle.

Philip E. Tetlock, a Canadian-American political scientist who teaches at the University of Pennsylvania, used Berlin's personality types (foxes and hedgehogs) in testing the ability of specialists and generalists to forecast outcomes in a 20-year experiment with 284 participants from 1984 to 2003.

Tetlock found that hedgehogs (specialists) performed worse in predicting outcomes (e.g. recognizing patterns through abductive reasoning) than foxes (generalists). In fact, specialists performed worse at

predicting outcomes in their own areas of expertise than generalists.⁸ In essence, a non-expert can better predict an outcome than an expert in his own domain.

In a 2012 article in *Harvard Business Review*, "All Hail the Generalists," Yale lecturer Vikram Mansharamani tells us that corporations value expertise. He uses trees in an analogy to explain specialists and generalists. Corporations want people who can study the bark of a tree, who get to know its grooves, texture and colors. But these same people, these experts, might not even understand that the bark is the outer layer of a tree or that the tree is part of a bigger forest. Their ability to focus into one core area comes at the expense of being able to put what they know into a bigger context.

Generalists can manage linking knowledge and recognizing patterns through uncertainty better than specialists. Generalists can see not only the tree, but the entire forest. Further, they can recognize the value and utility in what the specialist does and can frame it within the bigger picture.

The best generalists are highly empathic and can pick up on subtle nuances of the people and events around them. They can merge multiple viewpoints, ideas, and possibilities into new arrangements and recognize new patterns.

A generalist can also challenge a specialist to think differently, to interject ideas or opinions or points of view that the specialist hasn't heard before.

Likewise, the specialist cannot conceive of the future without the broader vision that generalists use to enlighten possibility. Generalists often make good leaders and visionaries and dreamers. Specialists can turn those visions and dreams into tangible realities. They need each other to succeed.

In Kauffman's matrix, the broader the scope of vision, the more relationships between products, services, industries, people, and ideas will be discovered. Firms like IDEO in Palo Alto understand Kauffman's matrix and put teams together to discover new uses for technologies and new ways to combine technologies in their problem solving. A narrow, highly focused view, however, will miss the most promising possibilities.

When a broad pattern is recognized by the generalist, the specialist can bring the vision back to earth, can serve as a reality check to what's doable.

⁸ In fact, he found that the biggest name forecasters, especially those who appear across major media outlets, were very poor forecasters. His findings found an inverse relationship between fame and accuracy. The more well known and famous someone was, the worse their ability to predict outcomes. Essentially, this means that we reward bad judgments over good judgments, according to Louis Menand, of *The New Yorker*. He said, "The accuracy of an expert's predictions actually has an inverse relationship to his or her self-confidence, renown, and, beyond a certain point, depth of knowledge." As an aside, confidence and over-confidence are often epidemic in senior management positions, so firms are smart to build teams of generalists and specialists, but also want people who can temper management overconfidence.

Visionary firms rely on a diverse mix of opinions and backgrounds, including both specialists and generalists. One is needed to recognize patterns and see possibility. The other is needed to turn a vision into reality.

Chapter 10: The visionary firm

The executive's dilemma and the visionary firm

Being a visionary, sensing inside and outside of our firms, often takes an act of faith. We have to believe that if we throw all the ingredients together, we'll open the oven and find a transformational surprise.

Those ingredients aren't always obvious and there's always some magic involved. But this magic is available to any of us, despite what journalists and academics would have us believe about the myth of the visionary hero.

Often, perhaps too often, executives and firms take short cuts. It's sometimes out of necessity. Sometimes to save costs. Sometimes because it's just too difficult to move or change the culture in a large firm. Most often, they just don't recognize the need to adapt or to prepare their organizations for change and transformation as the world changes around them. Perhaps they've learned that employees can react extremely negatively to change, even the suggestion of change. So, creating an entrepreneurial culture seems antithetic to the purposes of the organization.

Just as employees can be scared of change, so can shareholders.

Just ask this question to understand why: *If there's a need to change, why are we in this current business?*

This is the executive's dilemma.

Logically, it's tough for executives, employees and shareholders to recognize a firm's need for change *and* its need to continue with current practices. The ideas can seem mutually exclusive. But they aren't.

Executives are in a tough spot in getting buy-in, from below as from above. That's probably why so few firms make a serious attempt to adapt. Many executives talk about it, but they also know the challenges. Few executives are up to it. It's easier and safer to stay the course. The only problem is, it's not safer in the long term.

Pearl Harbor occurred because of a systems-wide information breakdown. Intelligence didn't move through a network to connect with other bits of information. Thus, no pattern of the threat emerged for the leadership in Hawaii to act on.

We want our firms to be more entrepreneurial and sensing. Being a visionary, is key to being entrepreneurial and agile. But being a visionary isn't something that's done alone, in a vacuum. It's a process of discovery: The more inputs and diversity of information there are, the more ideas will get

mixed around with other ideas. The bigger this mixture, the more likely a pattern and vision will emerge from it.

The visionary firm is the integrated firm. It's a firm based on strong corporate values and entrepreneurial leaders at every level, not just at the executive level.

The visionary firm is agile and uses dynamic capabilities. It can sense patterns in the market before others.

End of Book

Other chapters:

1. Artificial intelligence and human judgment
2. Innovation and technology?
3. Beyond Sensing (Moving resources and acting or putting some/all your chips in)
4. Sensing and strategy (what is strategy?)
5. Technology and the loss of wisdom (plus addiction to technology)
6. Sensing goes beyond technology
7. Great visionaries? Or simply learning to speak the truth?
8. Vision quests, meditation, psychedelics, and finding clarity (after Unlearning chapter)
9. Reductionism is the opposite of sensing? Or **reductionism and emergentism**
10. Futurism
11. Scenario planning
12. Unlearning
13. Flow
 - a. What does meaning mean
 - b. Stress and closing the mind. Overcoming stress to open the mind
14. Creativity
15. Cognitive biases and making life easier, more manageable, part of human evolution and our survival. Didn't I have this in one of my whitepapers?

(The sidebars below are to be interspersed throughout the chapter)

Sidebar: Tools for Executives

Paul Schoemaker and George Day published an article, "Scanning the Periphery," in *Harvard Business Review* back in 2005 on how executives could do a better job of sensing threats and opportunities. We've extracted and paraphrased a few of their suggestions.

- How do you identify important market signals?

It's difficult to separate signals from noise. One approach is take a signal that's been observed and project into the future by scenario planning or mapping possible futures from it.

- What are your peripheral customers really thinking?

Most executives are focused on their core market. Take some time to find out what's going on around the edges? Why are your marginal customers not moving to the center? Most companies suffer customer turnover. Find out why customers are leaving or why they hedging commitment.

- What future surprises could really hurt (or help) your organization?

Imagine apocalyptic scenarios for your organization and market. What are the worst things that could possibly go wrong in the future. Some of these may point to real threats or even to opportunities.

- What emerging technologies might change the game?

Look broadly at emerging technologies and explore how they might change your market, even if they are only being adapted for other markets. For example, Detroit probably never thought that artificial intelligence type technologies would impact the auto industry. But then Google developed a self-driving car.

Start with these and even come up with your own questions about your company, about your market and about the future. The future will be shaped by periods of slow progress interrupted by sharp, extreme jolts that will change both markets and behaviors.

Sidebar: Where to sense?

Key or novel information may appear from just about anywhere. Oftentimes, it's something small or non-consequential on its own, but when taken together with other bits of information, it creates a new pattern, something that stands out in some sort of novel way.

When sensing, we're typically not looking at the whole. We're looking at many small bits of disassociated information. Within that information we recognize patterns, many patterns. When we have an epiphany, usually there's some small bit of new information, a last puzzle piece, that brings everything into alignment.

Until that moment, we don't even know what puzzle pieces will end up being part of the reconfigured pattern, the vision. Remember our brains lighting up like a Christmas tree in Kounios and Beeman's analogy. Our minds are working on the entire puzzle at once and eventually, it comes together all at once. It's not a linear step-by-step process. It's a synthesis of the whole.

The catalyst is often a missing puzzle piece. Some small bit of information gets thrown into the blenders of our brains and emulsifies the mixture into the pattern. So, where can we look for this missing puzzle piece?

We can't know or at least we can't know exactly. There are some likely hiding places that we can routinely check, but sometimes, the puzzle piece will be found in one of them and sometimes it will appear from somewhere we had never thought to check. So, we have to be open to gathering information from just about any source.

To remain open to the possibilities, companies should attempt to gather information across as many sources big and small as possible.

Here's a list, albeit incomplete, of some obvious areas that can be utilized in gathering information inside and outside the firm.

Areas of Sensing

- **Employees**
Employees up and down an organization might sense an opportunity or threat that senior management hasn't yet noticed. Frontline and other customer facing employees might gain some insight based on changing customer behaviors or trends (patterns) they recognize across customers. David Packard used management by walking around to raise morale. It's also a great sensing technique to see the world through the eyes of those frontline workers.
- **Customers**
While employees might recognize changing customer behavior, companies can also go directly to their customers to ask what products/services are of interest and value. This is also relevant with peripheral customers (those customers who occasionally buy a company's products or services but routinely buy them elsewhere) and with former customers who have left to purchase products and services from another company.
- **Suppliers and Partners**
Just as frontline employees might recognize an opportunity, suppliers and partners offer a window into the broader market around a firm's core niche.
- **Competitors and Fringe Customers**
What are your competitors doing? Have they shifted in some way? What do their customers like about them? Why are your fringe customers leaving to go to competitors? Find out what your fringe customers want that you're not giving them. This might signal a big market shift on its way or changing consumer behaviors.
- **Technology**
What new technologies might change the way you or anyone else can do business. Look at how tech is transforming other industries. Can your industry be disrupted in the same way. These can be threats and opportunities.
- **Emerging/peripheral industries**

Are new industries popping up? What market forces created room for those emerging or peripheral industries to make gains? How else will those market forces play out?

- **Government**
Large firms bemoan the ever changing regulatory climate. New laws equal unanticipated and sometimes firm-killing expenses. Take the opposite mindset. Every regulatory change offers an opportunity if you can see it. Remember what Winston Churchill said, "A pessimist sees the difficulty in every opportunity; an optimist sees the opportunity in every difficulty." New regulations can create new markets. We've met several entrepreneurs who build their business models entirely around changes in the law. Large firms can approach regulatory change more as a startup and search out those opportunities. It's an area that few firms actually try to sense with an open mind. They are too busy fuming and lobbying to maintain the status quo instead of embracing change and opportunity.
- **Industry standards and other categorical mindsets**
George Lucas ran into Hollywood when it had a categorical mindset that merchandising wasn't highly profitable. Many, in Hollywood, actually treated merchandising as a form of marketing, nothing more. Industry executives are often stuck in a confirmation bias or the bias of Sunflower management. They are blind to the potential right in front of their eyes.
- **Accidental discoveries**
Play-Doh, Viagra, Penicillin: These are few accidental discoveries that changed the world. What ideas did your firm discard last year or over the past five or 10 years? Was there a great idea that landed on deaf ears when it was considered? Most large firms have huge slush piles of discarded ideas, services and products. One management consulting firm we know well is helping companies revisit the slush pile, looking at those ideas in search of a pattern that resonates in the present market.
- **Shift in consumer behavior**
Michelob Ultra, a low calorie beer, came out in 2002, just as the Atkins and South Beach diets were taking off. Coors tried to enter the market with Coors Aspen Edge in 2004, but by then, the trend was fading fast. The beer was discontinued in 2006. Agile firms are able to catch the wave of changing consumer behavior earlier than their competitors. Michelob Ultra is still produced 14 years later and Aspen Edge lasted a mere two years.

Sidebar: Design thinking

Design thinking was popularized in the mid 2000s by Tom and David Kelley at IDEO, but its core components go back much further.

Design thinking evolved from some of the group collaboration and innovation processes in the 1990s, which came from the creativity processes in the 1960s, 1970s and 1980s.

Often, the process of Design Thinking uses a collaborative approach to solve a problem, with heavy emphasis on creative insight and abductive reasoning. Some of the ideas in Design Thinking come out of the fields of architecture and industrial design, where companies focused on creating work spaces that

improved workplace collaboration and problem solving. Architects and designers are trained to imagine a future. This led to a whole systems approach to design (critical thinking and problem solving), where designers investigated known and unknown aspects of a situation, as well as present and possible future conditions to guide them in the design process.

Today, many companies have turned to IDEO and the Stanford d.School as well as to other experts in design thinking for help in imagining the future, in solving their business problems. IDEO began as an industrial design firm, creating products and tools that fit the needs of customers. It found that its creative and collaborative processes reached far beyond designing physical products and could help companies design their futures and solve problems through a whole systems approach.

Design thinking is a form of sensing within the dynamic capabilities framework.

Sidebar: Evolution of technology

In 1986, one of the founding members of the Santa Fe Institute, Robert McCormick Adams, who was also the Director of the Smithsonian Institute, had a chance meeting at a Smithsonian event with John Reed, who would soon become CEO of Citicorp. Citi's economists had completely missed signs of the impending economic downturn in Latin America and the bank suffered heavy investment losses. Reed couldn't understand how their economists missed so badly and was struggling to find anyone who could shed some light on the problem.

McCormick suggested to Reed that the Santa Fe Institute, which was just forming to study complexity in the physical sciences, might be able to help in understanding the problem, despite the fact that it was a social sciences problem.

In May of 1986, Reed visited SFI and participated in some brainstorming sessions with scientists and economists on the problem. In August, after a discussion of complexity in financial markets, Reed decided to fund a two-week workshop on "The Economy as an Evolving Adaptive System," bringing together 10 leading economists with 10 Institute scientists for an open discussion. The workshop led to SFI broadening its research into social and behavioral sciences.

W. Brian Arthur is an Irish-born economist and became one of the pioneers of the science of complexity, with a focus on complexity of the economy. He led Reed's workshop and then became SFI's first resident fellow. His work led to a broader understanding of both economics and technological progress. In 2009, he released his book, *The Nature of Technology: What it is and how it evolves*. In it, he lays out a framework for how technologies (and consequently, economies) evolve.

In the book, he says, "A novel technology emerges always from a culmination of previous components and functionalities already in place. We can step back from this observation and view origination with a wider-angle lens by seeing a novel technology as the culmination of a progression of previous devices, inventions and understandings that led up to the technology in question."

He goes on:

In fact, supporting any novel device or method is a pyramid of causality that leads to it: of other technologies that used the principle in question; of antecedent technologies that contributed to the solution; of supporting principles and components that made the new technology possible; of phenomena once novel that made these in turn possible; of instruments and techniques and manufacturing processes used in the new technology; of previous craft and understanding; of the grammars of the phenomena used and of the principles employed; of the interactions among people at all these levels described.

Arthur's insight is far reaching, for our understanding of both technology and economies. We can refine existing technologies or combine existing technologies to address a specific problem or newly recognized need. Innovation is about making these connections between existing technologies and a problem. We form a new narrative for how technology can or might be used. Out of this, we will develop a new technology (a refinement or a combination of existing technologies). New technology (progress) is a merely the result of continuous refinement and combining efforts to address new problems and needs.

We're of the belief that technologies can mean science, tools, methods, processes, and grammar (e.g. metaphor, narrative), among other things. We went to the moon on technology, but much of that technology was in method, systems and process development.

In essence, this is how progress happens.

R&D and innovation are two separate things. Innovation is about recognizing novel uses for existing or recombinant technologies, products, methods, and processes.

R&D comes after innovation, in developing and refining a marketable product or service. After we sense a problem and a possible solution (the innovation process), we can turn our efforts to R&D to develop the correct technology (tool, product, service, etc...).

Firms that understand that innovation isn't expensive R&D programs, but rather is about recognizing new patterns and finding new ways to link technologies and problems, will be a half step ahead of those who don't.

Vision (sensing), to us, is about being able to recognize new uses for technologies or ways to combine technologies to address new problems. For the visionary, these uses occur in the patterns of understanding.

Sidebar: The Power Law

The Power Law and unbalanced distributions

(Also, reference 80/20 theory)

Still need to write this sidebar.

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