CHAPTER ONE: MOTIVATION

11 Ochsner Clinic in New Orleans The facility is now known as the Ochsner Medical Center.


14 movement and emotion emerge This is how Mauricio Delgado, a neurologist at Rutgers, describes the striatum: “The striatum is the input unit of a larger structure, the basal ganglia. I say the input unit because it receives connections from different brain areas which subserve distinct brain functions—putting the striatum in a prime position to influence behavior. The basal ganglia and in turn the striatum are very important in facets of behavior related to motor (deficits in this structure is common in Parkinson’s patients), cognitive and motivation. One line of thinking regarding the striatum and its role in motivation and more specifically reward processing is that it is involved
in learning about rewards and using that information to make decisions that help guide behavior, updating the brain along the way whether a reward is better or worse than prior expectations.”


14 **motivation had disappeared** For my understanding of how brain injuries influence behavior, I am indebted to Julien Bogousslavsky and Jeffrey L. Cummings, *Behavior and Mood Disorders in Focal Brain Lesions* (Cambridge: Cambridge University Press, 2000).


16 **expectation and excitement** In some versions of this experiment, participants were rewarded for guessing right and penalized for guessing wrong with small financial winnings. In response to a fact-checking email, Delgado provided further context for the experiments: “The goal of that initial study was to investigate the human reward circuit. That is, we know from animal research that certain brain regions were important for processing information about reward. We knew less about how that translated to the human brain and how it translated to more common human rewards such as money, which had implications to behavioral addictions such as pathological gambling. Thus, with the guessing game, our initial goal was to compare what happened in the brain when participants received a monetary reward (for a correct guess)
and a monetary punishment or loss (for an incorrect guess). The pattern we observe is very characteristic of a reward response. We see activity in the striatum (both dorsal and ventral parts). The response is an initial increase at the beginning of the trial when the question mark appears and they make a guess. We reasoned that it reflected anticipation of a potential reward. Other work using this task (see Delgado et al. 2004, Leotti and Delgado 2011) support that as does the work by Brian Knutson (2001). They don't know yet if their guess is correct and lead to a reward or incorrect and lead to a loss. So the increase is common for both types of trials. Once the outcome is revealed, we see an interesting pattern where the striatum differentiates between a positive and negative outcome—a gain or a loss. It is increased for a gain and decreased response for a loss. One interpretation of this finding was that the striatum was coding for the value of an outcome. A more global interpretation that takes into account all the neural inputs and outputs of this structure is that it takes in information about the outcome/reward, it matches up with the expectations (e.g., was the outcome better or worse than expected—if you guessed high was the card high, or did you make the wrong guess) and allows for the system to update and inform the next decision (e.g., maybe try low next time)."

17 computer guessed for them In response to a fact-checking email, Delgado expanded his comments: “There were three experiments related to this...[In] the first one (Tricomi et al. 2004), they were told that they would see two circles. Upon seeing the yellow circle for example they would guess as before whether the correct answer was button 1 or 2 and were told that a correct response would yield a monetary reward. If they saw a blue circle they were told to press a button (motor control) but that the button had nothing to do with the reward, it was random. In truth, the reward was random in both cases, but if the subjects believed that their button press mattered, as in the yellow circle condition, then they engaged the striatum response much more than if it was a non-contingent reward. This experiment showed that if participants felt they were in control that the reward response was more prominent. The second experiment took this back to the card guessing game (Delgado et al. 2005) and this time added a cue, like a circle, before each trial that predicted if the card would be high or low. Participants had to learn via trial and error what the cue predicted. This experiment showed that the signal in the striatum was related to learning about the reward, rather than just purely processing the reward value... In [the] third experiment (Leotti and Delgado 2005) we presented subjects with let’s say two cues—a square and a circle. When they saw the square, they knew they would be faced with a 50/50 choice (a guess of sorts) and if they chose correctly, they would get a reward (no losses in this experiment, either a reward or no reward). In this condition, they felt in ‘control.’ Much like my participant who felt they could ‘beat the game.’ The
other condition was the no-choice condition. Here, they saw a circle and were faced with the same choice. Except this time the computer picked for them. And if the computer was right they got a reward. So in both conditions one could get a reward (or no reward). But the key difference was that participants either had a choice or the computer chose. Interestingly, people preferred the choice condition, even though such condition required more effort (the actual choice) and led to the same amount of rewards. We also saw that the striatum activity was present to the square (compared to the circle). That is, when participants found out they had a choice, we saw activity in this reward area of the brain, suggesting that the mere opportunity for exerting one’s choice may be rewarding in and of itself.


18 otherwise transitory positions A 2006 study by the Government Accountability Office found that 31 percent of workers were in temporary positions.


Notes


19 freedom to choose Leotti and Delgado, “Inherent Reward of Choice.”

19 *Psychological Science* in 2011 Ibid.


22 on a new life In response to a fact-checking email, Colonel Robert Gruny, commanding officer, Recruit Training Regiment, MCRD San Diego, wrote: “From the moment the recruits first step off of the bus onto the yellow footprints they are exposed to a degree of collective shock and stress that is designed to emphasize teamwork [and] obedience to orders and to reinforce the fact that they are entering into a new phase of their life in which selfless dedication to each other is coveted far more than individual achievement. In addition to the medical processing and haircuts reference above night one includes being checked for contraband, the very practical tasks of administrative processing and clothing issue, and making an initial call home to inform their parents or other designated individual that they have arrived safely at the Recruit Depot.”

22 their whole life In response to a fact-checking email, Colonel Gruny wrote regarding Krulak’s reforms: “The series of reforms were centered on the
institution of values based training into recruit training and the introduction of the Crucible. While self-motivation and leadership were certainly enhanced by these reforms they also focused on teamwork, followership, and core values development (honor, courage, and commitment). Gen. Krulak sought to embed a training philosophy that resulted in our Marines making the right kind of values based decisions, in combat or in peacetime."


25 that study, told me The specific experiment conducted by Professor Dweck described in this chapter was focused on her implicit theory of intelligence rather than locus of control. In an interview, she drew comparisons between that work and its implications for understanding locus of control.


26 ketchup bottles In response to a fact-checking email, Colonel Jim Gruny, commanding officer, Recruit Training Regiment, MCRD San Diego, wrote that “this sounds like a scenario that may have been accurate at the time the Marine describing it experienced recruit training. Recruits no longer clean mess halls. That said, this scenario does accurately illustrate the methods used by our drill instructors and the lessons they seek to impart on our recruits.”

27 obstacle courses In response to a fact-checking email, a spokesman for the USMC stressed that recruits are under supervision during the entirety of the Crucible, and that the area where the Crucible takes place is USMC property. In California, the Crucible takes place within Camp Pendleton; in Parris Island, South Carolina, it is an area around an old airstrip. Colonel Jim Gruny, commanding officer, Recruit Training Regiment, MCRD San Diego, wrote that “General Krulak pioneered the use of values-based training and a crucible to cement it among recruits. Krulak said his original intent for the Crucible as a culminating event was threefold. First, it would be the drill instructor’s last opportunity to give a ‘go or no go’ to the individual recruit. Second, it would ‘emphasize and reinforce all the core values training that was ongoing throughout recruit training’. . . Last, it would ‘bring the recruit from an emphasis on self-discipline to where we want them to be in combat, which is selflessness.’ . . . Failure to complete the Crucible may require a recruit to be recycled to another Company with which he can undergo the Crucible.
again. He will only be dropped from the Marine Corps if he repeatedly fails to
complete the Crucible or if he suffers an injury that prevents further military
service.” Colonel Christopher Nash, commanding officer, Weapons and Field
Training Battalion, wrote: “The Crucible is a 54-hour endurance event that
marks the transformation from civilian to U.S. Marine. Recruits, over a three
day period, will travel approximately 68 km on foot, eat no more than three
MREs for the duration of the event and operate with less than four hours of
sleep a night. The focus of the Crucible is core values and teamwork. Recruits
must overcome 24 stations/obstacles, participate in three core values discus-
sions and two night endurance events during the three days. No event can
be completed alone. The Crucible culminates with a 16 km ‘Reaper’ hike in
which an emblem ceremony occurs. During this event recruits earn the title
Marine.”

30 during basic training Joey E. Klinger, “Analysis of the Perceptions of
Training Effectiveness of the Crucible at Marine Corps Recruit Depot, San
Diego” (PhD diss., Naval Postgraduate School, 1999); S. P. Dynan, Updating
 Tradition: Necessary Changes to Marine Corps Recruit Training (Quantico, Va.:
Marine Corps Command and Staff College, 2006); M. C. Cameron, Crucible
Marine on Point: Today’s Entry-Level Infantry Marine (Quantico, Va.: Marine
Corps Command and Staff College, 2006); Michael D. Becker, “’We Make
Marines’: Organizational Socialization and the Effects of ‘The Crucible’ on
the Values Orientation of Recruits During US Marine Corps Training” (PhD
diss., Indiana University of Pennsylvania, 2013); Benjamin Eiseman, “Into
the Crucible: Making Marines for the 21st Century,” Military Review 80, no. 1
(2000): 94; Terry Terriff, “Warriors and Innovators: Military Change and Or-
ganizational Culture in the US Marine Corps,” Defense Studies 6, no. 2 (2006):
215–47; Antonio B. Smith, United States Marine Corps’ Entry-Level Training
for Enlisted Infantrymen: The Marginalization of Basic Warriors (Quantico, Va.:
Marine Corps Command and Staff College, 2001); William Berris, Why Gen-
eral Krulak Is the Marine Corps’ Greatest Strategic Leader (Carlisle Barracks,
Penn.: U.S. Army War College, 2011); Terry Terriff, “Of Romans and Dragons:
Preparing the US Marine Corps for Future Warfare,” Contemporary Security
Policy 28, no. 1 (2007): 143–62; Marie B. Caulfield, Adaptation to First Term
Enlistment Among Women in the Marine Corps (Boston: Veterans Administra-
tion Medical Center, 2000); Craig M. Kilhenny, “An Organizational Analysis
of Marine Corps Recruit Depot, San Diego” (PhD diss., Naval Postgraduate
School, 2003); Larry Smith, The Few and the Proud: Marine Corps Drill Instruc-
tors in Their Own Words (New York: W. W. Norton, 2007); Thomas M. Cook,
Raymond W. Novaco, and Irwin G. Sarason, “Military Recruit Training as an
Environmental Context Affecting Expectancies for Control of Reinforcement,”


35 **They didn’t feel anything** In response to a fact-checking email, Habib expanded upon his comments and said that rather than categorize the patients as not understanding feelings, it might be more accurate to say “it is a matter of expression of feelings, more than feeling itself. They can recall what they felt before, and there is no evidence they cannot feel it anymore. Instead, it
seems that since they have no more manifestations of seeking satisfaction, they look like they had no feeling. This is also an intriguing observation, since it suggests that the intensity of feelings is dependent upon the individual's capacity of seeking satisfaction or reward.”

CHAPTER TWO: TEAMS


40 “didn't gel.” In an email sent in response to fact-checking questions, Julia Rozovsky wrote: “There were a few members of my study group that I developed close friendships with, however I was much closer to my case study team.”


41 were at Yale In an email sent in response to fact-checking questions, Julia Rozovsky wrote: “We chose to enter the competition each time. Each competition was a separate team/entry/packet/process. I just happened to work with the same team fairly consistently.”


42 America's top workplaces In 2007, 2008, 2012, 2013, and 2014, Google was ranked number one by Fortune.
In an email sent in response to fact-checking questions, Julia Rozovsky wrote: “I worked on several other efforts prior to joining the Project Aristotle team. Here’s a quick bio that I use internally: ‘Julia Rozovsky joined Google’s People Analytics team in August 2012. During her time at Google, Julia has advised teams on workforce planning and design strategies, analyzed the impact of workplace flexibility programs, and conducted research on empowering leaders. She is currently the [project manager] of Project Aristotle, which aims to improve team effectiveness at Google. Prior to Google, Julia collaborated with Harvard Business School academics on competitive strategy and organizational behavior research focusing specifically on game theory, ethics and financial controls, and organizational structure. Earlier in her career, Julia was a strategy consultant with a boutique marketing analytics firm. Julia holds an MBA from the Yale School of Management, and a BA in mathematics and economics from Tufts University.’”

In comments sent in response to fact-checking questions, a Google spokeswoman wrote: “The first thing we had to start with was the definition of a team, and we arrived at groups of people collaborating closely on projects and working toward a common goal. Then, since we knew a hierarchical team definition would be too limiting in our environment where people collaborate across reporting lines, we had to figure out how to systematically identify intact teams and their accurate membership so we could study them. In the end, we had to do it manually, by asking senior leaders to identify teams in their orgs and ask the teams’ leads to confirm the members.”


46 **put her on guard** In an email sent in response to fact-checking questions, Julia Rozovsky wrote: “This is how the study group felt from time to time. Not consistently.”

46 **equally successful group** In comments sent in response to fact-checking questions, a Google spokeswoman wrote: “We wanted to test many group norms that we thought might be important. But at the testing phase we didn’t know that the how was going to be more important than the who. When we started running the statistical models, it became clear that not only were the norms more important in our models but that 5 themes stood out from the rest.”

“slip through the cracks” In an email sent in response to fact-checking questions, Edmondson wrote: “It’s not MY insight that mistakes occur because of system complexity (and its challenging combination with patient heterogeneity). . . . I am merely the messenger bringing that perspective to certain audiences. But yes, the opportunities for slipping through are ever-present, so the challenge is building awareness and teamwork that catch and correct and prevent the slips.”


50 her Google colleagues In an email responding to fact-checking questions, a Google spokeswoman wrote: “We found Edmondson’s papers on psych safety very useful when trying to figure out how to cluster norms that we saw popping up as important into meta-themes. When we reviewed the papers about psych safety, we noticed that norms like allowing others to fail without repercussions, respecting divergent opinions, feeling as if others aren’t trying to undermine you are all part of psychological safety. This became one of our five key themes, along with dependability, structure/clarity, job meaning, and impact.”

51 would never stop For my understanding of the early days of Saturday Night Live, I am indebted to those writers and cast members who were willing to speak with me, as well as Tom Shales and James Andrew Miller, Live from New York: An Uncensored History of “Saturday Night Live” (Boston: Back Bay Books, 2008); Ellin Stein, That’s Not Funny, That’s Sick: The National Lampoon and the Comedy Insurgents Who Captured the Mainstream (New York: Norton, 2013); Marianne Partridge, ed., “Rolling Stone” Visits “Saturday Night Live” (Garden City, N.Y.: Dolphin Books, 1979); Doug Hill and Jeff Weingrad, Saturday Night: A Backstage History of “Saturday Night Live” (San Francisco: Untreed Reads, 2011).

53 “never be heard from again” In an email sent in response to a fact-checking question, Schiller wrote: “It was an intense experience for me since I had never lived in New York or worked on a comedy-variety show. A lot of us were new to Manhattan and as such, hung out a lot together not only because New York at that time was sort of dangerous and scary, but also we didn’t know that many people and we were formulating the show. We were in our midtwenties and early thirties. Yes, we’d eat at restaurants and go to bars together even when out of the studio. We moved en masse, trying to make each other laugh.”


54 team intensely bonds Donelson Forsyth, Group Dynamics (Boston: Cengage Learning, 2009).
54 “It was a stalag” Alison Castle, “Saturday Night Live”: The Book (Reprint, Cologne: Taschen, America, 2015).

55 “someone else was failing” In an email sent in response to a fact-checking question, Beatts wrote: “My Holocaust joke, which was certainly said in jest because there is no other way to say a joke, had nothing whatsoever to do with the show’s writers. The exact wording was ‘Imagine if Hitler hadn’t killed six million Jews, how hard it would be to find an apartment in New York.’ It was a joke about the difficulty of finding apartments in New York, riffing off New York’s large Jewish population and general ethnic feeling, a la ‘You don’t have to be Jewish to love Levy’s rye bread. But it wouldn’t hurt.’ Zero to do with the writers. Marilyn Miller took offense at the mere mention of Hitler and the Holocaust, which to her could not be a subject for comedy. . . .

[Regarding] competition among the writers, not that it didn’t exist, because it did, but . . . everyone always had a chance to come back swinging the following week. Also the other writers and everyone in general, despite the competition for airtime, Lorne’s approval, audience appreciation, etc., were always very supportive of other people’s efforts and sympathetic to each other’s failures. No one went around rubbing their hands in glee and going haha, your sketch was cut and mine wasn’t, so there! It was more an attitude of ‘Better luck next time.’ I think everyone felt part of a family, maybe a dysfunctional family, but a close-knit family all the same. I would say that there is more backstabbing and jealousy and rivalry and competition and cliqueishness on the average middle school playground than there ever was at SNL during the time I was there.”

55 “stuff for other people” In an email sent in response to fact-checking questions, Alan Zweibel wrote: “I wasn’t angry because of anything to do with that character or the process in which it was written. She and I weren’t speaking for reasons that I really can’t recall. But after about three shows where I didn’t write with her (and for her) we both realized that our work was suffering—that we were better as a team than we were individually—so we buried the hatchet and began collaborating again.”

56 “it could be brutal” In an email sent in response to a fact-checking question, Schiller wrote: “I would say that some, not all, comedy writers and stand-up comedians have some sadness or anger in their life that helped fuel their comedy. They are fast with quips, and the stand-ups were used to hecklers and had to be prepared with a quick comeback. So just as much as they can say something sharply funny, they can also jab you with a quick, hostile (but also funny) remark. . . . The atmosphere at SNL, although we all liked each other, could become highly competitive based on the fact that there were 10 writers and only so many sketches could go on the show, so we all did our best to write the winning sketch or make (in my case) the best short film.”


61 *University of Cambridge* Baron-Cohen et al., “‘Reading the Mind in the Eyes’ Test Revised Version,” 241–51.

63 “more initials he sees” In an email sent in response to fact-checking questions, Alan Zweibel wrote: “[Michaels] had said that he likes when there’s a lot of initials at the top of the page because it meant that it had a variety of input and sensibilities. I believe that the show has lasted 40 years because Lorne is a genius when it comes to recognizing talent, rolling with the changing times, and encouraging everyone (while developing their individual voices) to work with each other so the total is greater than the sum of its parts.”
63 “the pain!” In the script that made it to air, O’Donoghue says, “‘I know I can! I know I can! I know I can! I know I can! Heart attack! Heart attack! Heart attack! Heart attack! Oh, my God, the pain! Oh, my God, the pain! Oh, my God, the pain!’” It is worth noting that the original concept for depressing children stories originated with O’Donoghue, not Garrett.

CHAPTER THREE: FOCUS


72 **flying them home** Air France has argued that it is inappropriate to blame pilot error as the primary cause for the crash of Flight 447. (This perspective is disputed by numerous aviation experts.) Air France was presented with a complete list of questions regarding details discussed in this chapter. The airline declined to comment on issues that fell outside of those topics discussed in the official report regarding Air France Flight 447 published by the Bureau d’Enquêtes et d’Analyses pour la sécurité de l’aviation civile, or BEA, which is the French authority responsible for investigating aviation accidents. In a statement, a spokesman for Air France wrote: “It is essential to remember that the BEA investigation report, the only official and public investigation to date, discusses and develops many of the subjects mentioned [in this chapter]. This report is available on the BEA website in English. We can only direct the journalist to this report to supplement our answers.”

72 **rotated responsibilities** In response to questions, a spokesman for Air France noted that automation on long-haul aircraft preceded the A330 by twenty years, and that at one time “the crew included a flight engineer, who was responsible for monitoring all aircraft systems during the flight. On modern aircraft, the flight engineer has disappeared, but the requirement of monitoring aircraft systems remains. This is carried out by the pilots. Finally, now
as in the past, beyond a certain flight time the crew is reinforced by one or more additional pilots to enable each pilot to take a rest period.”


73 One hundred and one people Ninety-nine people were killed instantly in this crash. Two later died from complications.


73 other human errors Aviation Safety Network, NTSB records.

74 ascended by three thousand feet In response to questions, a spokesman for Air France wrote: “It has not been shown by the BEA that the action to pitch up is the result of the pilot’s actions faced with the rolling of the aircraft, but rather the loss of altitude read, the vertical speed on descent of 600 ft per minute, the noise, the pitch that had diminished during the seconds before etc.”

75 said Bonin In response to questions, a spokesman for Air France wrote: “What is written is true, but does not throw light comprehensively on this phase because of the lack of some essential elements, such as the fact that the STALL alarm went off twice at the beginning of the incident which may have led the pilots to doubt its validity when it went off repeatedly. The BEA report stated that audio alarms are not ‘unmissable’ and that on the contrary they are often the first to be ignored.”


76 misstep can be tragic For more on this topic, I particularly recommend Martin Sarter, Ben Givens, and John P. Bruno, “The Cognitive Neuroscience


77 of common sense In response to a fact-checking email, Strayer expanded his comments: “With automated systems, we may not focus or concentrate attention on the task—we even mind wander in boring or repetitive settings. It takes effort to concentrate attention and this can lead to high levels of mental workload and we see a ‘vigilance decrement’ where attention lapses (and we make errors and miss critical events). This is often the case with monitoring tasks (keep an eye on the autonomous system) and when things go awry we may not notice or react on autopilot (even if this is not the correct action—we refer to this as slips where autopilot took over).”


80 throughout the flight The automatic warning system of this A330 was programmed so that the stall warning would cease when the plane’s stall was most severe. In some situations, when the pitch attitude was too high and the airflow into the pitot tubes too low, the computer assumed the data it was gathering was erroneous. So it sounded no alarms. Thus, a perverse situation arose for Flight 447 after the pitot tubes thawed: At times, when Bonin did something to make the stall worse, the alarm stopped. The computers worked as programmed, but the result was information that might have been confusing to the pilots.


82 announcement of any kind In a fact-checking conversation, Stephen Casner, a research psychologist at NASA, said that if a plane was falling at ten thousand–plus feet per minute, the g-force would be pretty close to 1, and as a result, it would be unlikely the passengers would have noticed that anything was amiss. However, he added, “Actually, no one knows what that feels like. Everyone who has felt what it’s like to lose 10,000 feet a minute dies pretty soon after feeling it.”

83 ten thousand feet per minute In response to questions, a spokesman for Air France wrote: “A fundamental aspect is that the STALL alarm stopped when the speed fell below 60 kts, leading the pilots to think they were out of the stall. Especially that every time they pushed on the stick to try and get out of the stall situation, the STALL alarm started to work again, leading them to cancel their pitching action! Also, during the last phase, vertical speed indications were unstable, adding doubt and confusion in the pilots’ minds.”
In an email sent in reply to a fact-checking inquiry, Crandall wrote: “In 1986, I began working with Dr. Gary Klein at his company Klein Associates Inc. The work you mention with firefighters and military commanders had already begun when I joined the company. It continued for many years, expanding well beyond firefighting and military command and control, and was carried out by Gary and the Klein Associates research team (who were an amazing bunch of very smart talented quirky people). I had both research and management positions at Klein Associates, and I was involved in some of those studies, not in others. As owner and Chief Scientist, Gary led our efforts to describe how (some) people are able to ‘keep their heads in chaotic environments’ and particularly how (some) people are able to make effective decisions under conditions of stress, risk, and time pressure. . . . It is correct that in the interviews we conduct, when asked about decision making and how a person knew to do X in a particular situation, they often respond with, ‘experience’ or ‘gut feel’ or ‘intuition’ or ‘I just knew.’ . . . These accounts of an intuitive basis for decision making became a cornerstone of our research efforts. . . . The studies we did in the NICU confirmed what we were finding in other work domains—highly experienced, highly skilled personnel become very good at paying attention to what’s most important (the critical cues) in a given situation, and not getting distracted by less important information. . . . Over time and repeated experience with similar situations, they learn what matters and what doesn’t. They learn to size up a situation very quickly and accurately. They see connections across various cues (clusters; packages; linkages) that form a meaningful pattern. Some people refer to this as a gestalt, and others as ‘mental models’ or schemas.” For more details, please see Beth Crandall and Karen Getchell-Reiter, “Critical Decision Method: A Technique for Eliciting Concrete Assessment Indicators from the Intuition of NICU Nurses,” Advances in Nursing Science 16, no. 1 (1993): 42–51; B. Crandall and R. Calderwood, “Clinical Assessment Skills of Experienced Neonatal Intensive Care Nurses,” Contract 1 (1989): R43; B. Crandall and V. Gamblian, “Guide to Early Sepsis Assessment in the NICU,” Instruction Manual Prepared for the Ohio Department of Development Under the Ohio SBIR Bridge Grant Program (Fairborn, Ohio: Klein Associates, 1991).

In an email sent in reply to a fact-checking inquiry, Crandall wrote: “The other nurse was a preceptee—in training to provide nursing care in a NICU. Darlene was her preceptor—helping her learn and providing oversight and guidance as she learns how to care for premature babies. So, the baby WAS Darlene’s responsibility in the sense that she was supervising/precepting the nurse caring for the baby. You are correct, she noticed that the baby didn’t look ‘good.’ Here is the incident account that we wrote up based on our interview notes: ‘When this incident took place, I was
teaching, serving as a preceptor for a new nurse. We had been working together for quite awhile and she was nearing the end of her orientation, so she was really doing primary care and I was in more of a supervisory position. Anyway, we were nearing the end of a shift and I walked by this particular isolette and the baby really caught my eye. The baby’s color was off and its skin was mottled. Its belly looked slightly rounded. I looked at the chart and it indicated the baby’s temp was unstable. I also noticed that the baby had had a heel stick for lab work several minutes ago and the stick was still bleeding. When I asked my orientee how she thought the baby was doing, she said that he seemed kind of sleepy to her. I went and got the Doctor immediately and told him we were “in big trouble” with this baby. I said the baby’s temp was unstable, that its color was funny, it seemed lethargic and it was bleeding from a heel stick. He reacted right away, put the baby on antibiotics and ordered cultures done. I was upset with the orientee that she had missed these cues, or that she had noticed them but not put them together. When we talked about it later I asked about the baby’s temp dropping over four readings. She had noticed it, but had responded by increasing the heat in the isolette. She had responded to the ‘surface’ problem, instead of trying to figure out what might be causing the problem.”


88 the child’s bassinet In response to a fact-checking email, Crandall wrote: “The key to this story (for me anyway) is that experts see meaningful patterns that novices miss altogether. As an experienced NICU nurse, Darlene has seen hundreds of babies. She is not reflecting on all of them . . . they have merged into a sense of what is typical for a premie baby at X weeks. She has also seen many babies with sepsis (it happens a lot in NICUs, for a variety of reasons unrelated to quality of care). The combination of cues (bloody bandaid, falling temp, distended belly, sleepiness/lethargy) brought with it the recognition ‘this baby is in trouble’ and ‘probably septic.’ At least, that’s what she told us in the interview. . . . I agree that people often create narratives to help explain what’s going on around them, and help them make sense—particularly when they are having trouble figuring something out. In this incident, Darlene was not having trouble figuring out what was going on—she recognized immediately what was going on. . . . I think of Darlene’s story as being about expertise, and the difference between how experts and novices view and understand a given situation. . . . Storytelling takes time, and stories are linear (this happened, then this, and then that). When experienced people describe events such as this one, what happens is very fast: They ‘read’ the situation, they understand what’s going on, and they know what to do.”

90 “It’s even harder now” In response to a fact-checking email, Casner expanded his comments: “I wouldn’t say that pilots are ‘passive’ but that they find it exceedingly difficult to maintain their attention on an automated system that works so reliably well. Humans are not good at sitting and staring. . . . Humans have limited attentional resources (e.g., how our kids do stuff behind our backs and get away with it). So we have to keep our attention pointed in the direction that we think is most important at all times. If a cockpit computer in front of me has worked impeccably for 100 hours in a row, it’s hard to envision that as being the most important thing to think about. For example, my kid could be getting away with some insane stuff at that very moment. In our study of mind wandering among pilots [Thoughts in Flight: Automation Use and Pilots’ Task-Related and Task-Unrelated Thought], we found that the pilot flying was thinking ‘task-unrelated thoughts’ about 30% of the time. The other pilot, the monitoring pilot, was mind wandering about 50% of the time. Why wouldn’t they? If you don’t give me something important or pressing to think about, I’ll come up with something myself.”


90 **leveraged existing skills** In response to a fact-checking email, Van Alstyne expanded upon his comments: “One of the original hypotheses attributed the gains of the smaller project load to the efficacy associated with economies of specialization. Doing a singular, focused activity can make you very good at that activity. The idea goes all the way back to Adam Smith and the efficiency associated with focused tasks at a pin factory. Generalization, or pursuing diverse work in our context, meant spreading projects across finance, education, and commercial IT. These are very different industries. Running projects across them requires different knowledge and it also means tapping different social networks. Specialization, in these consulting projects, meant focusing on, say, just the finance projects. Knowledge could be deepened within this focal area and the social network could be adapted to finance contacts alone. At least this is one theory as to why specialization might be better. Obviously, specialization can restrict the number of possible projects—there might not be a new finance project when there does happen to be one, or several, in education or IT. But perhaps if you wait, you’ll get another finance project.”

91 **deemed a success** In response to a fact-checking email, Van Alstyne identified other reasons why joining small numbers of projects, and a project at its start, had benefits: “The first is multitasking. Initially, taking on new projects strictly increases output, in this case revenues generated by these consultants. Revenue growth can continue even past the point where the productivity on a given project starts to fall. Consider a project as a collection of tasks (assessing client needs, generating target candidates, selecting candidates, vetting resumes, presenting options to clients, closing the deal . . . ). As a person takes on new work, its tasks displace some tasks of the existing work. So an existing project can take longer when a person takes on a new project, drawing out the period over which he/she gets paid. Total throughput, however, can still rise for awhile as a person takes on new projects. The stream of revenues brought in by a person juggling 6 projects tends to be higher than the stream of revenues brought in by a person juggling 4 even though each of
the 6 projects takes longer than it would have taken if it were only in a group of 4. At some point, however, this relationship trends completely downward. New projects take too long and revenues decline. Taking on another project strictly decreases productivity. As one consultant put it, ‘There are too many balls in the air and then too many get dropped.’ It takes too long to complete tasks, some tasks are not completed at all, and the flow of revenues dribbles out over a really long period. So there is an optimal number of projects to take on and this is below 12. The second consideration, as you suggest, is access to rich information. This exhibits a similar invert-U pattern. We were able to judge how much novel information each person received by tracking their actual email communication. We measured this both in a sense of ‘variance,’ i.e., how unusual was a fact relative to other received facts, and also in terms of ‘volume,’ i.e., how many new facts a person received. . . . Initially, greater access to more novel information strictly increased productivity. Superstars did receive about 25% more novel information than their typical peer and this access to novelty helped predict their success. Eventually, however, those outlying people who received the absolute highest novelty—about twice that of the superstars—were less productive than the superstars. Either excess information was too weird, off-topic, and not actionable or excess information was too much to process. A massive volume of novelty introduces the white-collar worker’s equivalent of the ‘Where’s Waldo’ problem: You can’t find the important information in all the noise. Both of these factors were statistically significant predictors of the superstars.”


95 de Crespigny later told me I am indebted to Captain de Crespigny for his time as well as his book, QF32. In an interview, de Crespigny emphasized that he is speaking for himself, and not for Qantas, in recalling and describing these events.
"models they can use" In response to a fact-checking email, Burian expanded upon her comments and said that her comments should be read in the light of “shifting focus from what was wrong/malfunctioning/not available to what was working/functioning/available was a turning point. I spoke of how this happened for him in this specific situation but generalized to how this shift in mindset has been found to be quite helpful to pilots, particularly when faced with multiple failure conditions. . . . Modern aircraft are highly technically advanced and their system designs are tightly coupled and fairly opaque. This can make it quite difficult for pilots to understand the whys and wherefores of some malfunctions and how multiple malfunctions might be associated with each other. Instead of trying to sort through a myriad of malfunctions and think about how they are connected and the implications they have, shifting focus to an aircraft’s capabilities simplifies the cognitive demands and can facilitate deciding how to do what is needing to be done. . . . Once a critical event has occurred, really good pilots do several things—they try to determine what is most critical to be dealt with first (narrowing of attention) but also pull back from time to time (broadening of attention) to do two things: 1) make sure they are not missing cues/information that might contradict or alter their understanding of their situation and 2) track the overall situation as part of their assessment of the most critical things to be attending to. For example, consider a catastrophic emergency (requiring an emergency landing/ditching) that occurs at cruise altitude. The crew will have some time to deal with the condition, but at some point, their attention should shift from dealing directly with the malfunction/condition to preparing for and executing a ditching/landing. Good pilots are constantly assessing the actions being taken, their efficacy, and needed actions relative to the overall status of the aircraft and phase of flight. Of course, good pilots also fully enlist the help of others in doing all this (i.e., good CRM). Good pilots also do a lot of ‘what if’ exercises before any event occurs, mentally running through a variety of scenarios to think about what they might do, how the situation might unfold, circumstances that would alter the way(s) in which they would respond, etc. General aviation pilots are taught to do something similar during flight when they say to themselves at various points along their route ‘If I were to lose my (only) engine right now (i.e., engine dies), where would I land?’

“land the plane” In response to a fact-checking email, de Crespigny expanded upon his comments: “Dave used [an onboard computer] program to check the landing distance. His first pass resulted in NO SOLUTION because there were too many failures for the program to come up with a landing solution. Dave then simplified the entries for the failures. The LDPA program [the landing distance performance application] then displayed a landing distance
margin of just 100 metres. Whilst Dave and the others were calculating the performance (that turned out to be incorrect anyways because of errors in the LDPA program and more extensive aircraft (brakes) damage than what was reported), I kept a broad situation awareness of the entire operation: aircraft, fuel, critical paths, pilot duties, cabin crew, passengers, air traffic control, emergency services. . . . Simplifying the A380 (with 4,000 parts) down to a Cessna (the flying version of the 1938 Ariel Red Hunter motorcycle) kept things very simple for me, removing the complexity, making each system simple to understand from a mechanical (not mechatronic perspective), simplifying my mental model of the aircraft's systems, freeing up mind-space to manage the entire event. It [is] vital in an emergency that there is a structured hierarchy of responsibility and authority. It's even more important that pilots understand the roles, tasks, and teamwork required in an autonomous team of just two pilots (more in our case on board QF32), isolated from help but in charge of 469 lives."

101 fail every time In response to a fact-checking email, de Crespigny explained that it is impossible to get a simulator to re-create the conditions of QF32, because the problems with the plane were so extreme.

CHAPTER FOUR: GOAL SETTING

journal.com/2002/nov/4th-round.htm; P. R. Kumaraswamy, Revisiting the
of Defeat: The Memory of the Yom Kippur War in Israeli Society,” Middle
Eastern Studies 29, no. 3 (1993): 411; Simon Dunstan, The Yom Kippur War:
The Arab-Israeli War of 1973 (Oxford: Osprey Publishing, 2007); Asaf Siniver,
The Yom Kippur War: Politics, Legacy, Diplomacy (Oxford: Oxford University

104 “sharp as possible” Bar-Joseph, Watchman Fell Asleep.

105 nothing more than words In an email, the historian Uri Bar-Joseph
wrote that the concept was “a set of assumptions that were based on docu-
mented information that was passed to Israel by Ashraf Marwan, the son-in-
law of late president Nasser and a close advisor to Sadat, who since late 1970
worked for the Mossad. The main assumptions were: (1) Egypt cannot occupy
the Sinai without neutralizing the Israeli air-superiority. The way to do it is
by attacking the bases of the [Israeli Air Force] at the beginning of the war. In
order to do it, Egypt needs long-range attack aircraft which she won’t have be-
fore 1975; (2) In order to deter Israel from attacking strategic targets in Egypt,
Egypt needs Scud missiles that will be able to hit Tel Aviv. Scuds started arriv-
ing in Egypt in the summer of 1973 but were not expected to be operational
before February 1974. (3) Syria will not go to war without Egypt. Zeira became
an ardent believer in these assumptions and turned them into an orthodox
conception, which he kept until war started.”

106 within the next decade Bar-Joseph and Kruglanski, “Intelligence Failure
and Need for Cognitive Closure,” 75–99.

107 need for cognitive closure For more on cognitive closure, please see
Steven L. Neuberg and Jason T. Newsom, “Personal Need for Structure: Indi-
vidual Differences in the Desire for Simpler Structure,” Journal of Personality
and Social Psychology 65, no. 1 (1993): 113; Cynthia T. F. Klein and Donna M.
Webster, “Individual Differences in Argument Scrutiny as Motivated by Need
the Seizing and Freezing of Negotiator Inferences: Need for Cognitive Closure
Moderates the Use of Heuristics in Negotiation,” Personality and Social Psy-
chology Bulletin 25, no. 3 (1999): 348–62; A. Chirumbolo, A. Areni, and G. Sen-
sales, “Need for Cognitive Closure and Politics: Voting, Political Attitudes and
W. Kruglanski, The Psychology of Closed Mindedness (New York: Psychology
Press, 2013); Arie W. Kruglanski et al., “When Similarity Breeds Content: Need
324 Notes


109 it has been selected Ibid.; De Dreu, Koole, and Oldersma, “On the Seizing and Freezing of Negotiator Inferences,” 348–62.

109 we’re making a mistake In an email responding to fact-checking questions, Arie Kruglanski wrote: “People under high need for closure have trouble appreciating others’ perspectives and points of view. People under high need for closure also prefer hierarchical, autocratic, decision making structures in groups because those provide better closure than horizontal or democratic structures that tend to be more chaotic. People under high need for closure are therefore intolerant of diversity, and of dissent in groups and aren’t very creative. Politically, conservatives tend to be higher on need for closure than liberals, but people with high need for closure tend to be more committed to things and values than people low on need for closure.”


110 outside the organization Uri Bar-Joseph, “Intelligence Failure and Success in the War of Yom Kippur,” unpublished paper.

113 before war broke out Abraham Rabinovich, “Three Years Too Late, Golda Meir Understood How War Could Have Been Avoided,” The Times of Israel, September 12, 2013.

115 Israelis were killed or wounded Zeev Schiff, A History of the Israeli Army, 1874 to the Present (New York: Macmillan, 1985).

“Even a quarter century later” Kumaraswamy, *Revisiting the Yom Kippur War.*


117 **best way to set goals** Gary P. Latham, Terence R. Mitchell, and Dennis L. Dossett, “Importance of Participative Goal Setting and Anticipated Rewards


118 “Making yourself break a goal” In an email responding to fact-checking questions, Latham wrote that achieving goals also requires access to the necessary resources and feedback on goal progress. “For long-term/distal goals, proximal/sub goals should be set. Sub goals do two things: maintain motivation for attaining the distal goal as the attainment of one sub goal leads to the desire to attain another sub goal. Second, feedback from pursuit of each sub goal yields information as to whether you are on- or off-track.”


120 “the right things,” said Latham In an email responding to fact-checking questions, Latham wrote: “When people lack the ability to attain a performance goal, that is, a goal having to do with a specific desired result such as a golf score of 80 or a 23% increase in revenue, [improper focus or tunnel vision] may occur. The solution is to set a specific, challenging learning goal where the emphasis is on discovering/developing a process, procedure, system that will enable you to improve your performance such as [coming] up with 5 ways you can improve your putting as opposed to put the ball in the cup in no more than 2 strokes.”

121 business school, for help Kerr was initially one of twenty-four consultants brought in by Jack Welch to expand Work-Outs throughout GE.

121 “turn out great” In an email responding to fact-checking questions, Kerr wrote: “I stressed to the leadership teams that ‘saying no to a bad idea is as useful as saying yes to a good one,’ but that they couldn't dismiss any recommendation by saying things like: ‘We thought of that already,’ or ‘We tried it before and it didn’t work.’ I always made the point that Work-Outs present a terrific opportunity to teach people about the business, and that they owed people a professional, courteous explanation as to why they didn’t support a particular recommendation.”

121 SMART criteria In an email responding to fact-checking questions, Kerr wrote that he never encouraged people to submit proposals without a rough plan and timeline. “The details of the plan would have to be sketched out after approval,” he wrote.

122 “ideas are fair game” Cosco, “General Electric Works It All Out,” 48–50.


123 invent a faster train The story of Japan’s bullet train as it was told to Jack Welch (and has been repeated in popular nonfiction) differs slightly from the historical record. The account given here reflects the story that was told to Welch, but there are some details that story did not include, such as the fact that the concept for high-speed rail was explored but then abandoned by the Japanese railway prior to World War II. In an email responding to fact-checking questions, a representative of the Central Japan Railway Company wrote that in the 1950s the “Tokaido Line, the main line of Japan, was very crowded and [passengers had] been increasing because of the economical growth after the war, and Japan had to meet the growing needs of passengers to move between Tokyo (capital and largest city) and Osaka (second largest city). Actually there was a concept of ‘Bullet train’ before the WWII, [in] 1939... but because of the war, that plan [had] been suspended. Japan National Railway decided to build [a] new line by standard gauge (many of Japanese conventional lines adopted narrow gauge) in 1957. The plan [was accepted] in 1958 by the government and construction had started.” It is also worth noting that private efforts at developing faster trains were also occurring at the same time in Japan. The Odakyu Electric Railway, for instance, was developing a train capable of going ninety miles per hour. For a better understanding of the history of the bullet train, I recommend Toshiji Takatsu, “The History and Future of High-Speed Railways in Japan,” Japan Railway and Transport Review 48 (2007): 6–21; Mamoru Tani-guchi, “High Speed Rail in Japan: A Review and Evaluation of the Shinkansen Train” (working paper no. UCTC 103, University of California Transportation Center, 1992); Roderick Smith, “The Japanese Shinkansen: Catalyst for the

123 120 miles per hour In an email responding to fact-checking questions, a representative of the Central Japan Railway Company wrote that “in Japan, [a] JNR (Japan National Railway) engineer was considered [the] elite of Japanese engineers at that time, and the engineer who designed Shinkansen (Mr. Shima) was one of the engineers of JNR . . . . He [had] been working in JNR [a] long time already and had knowledge and experience about railways.” Mr. Shima, the spokesperson noted, was asked, starting in 1955, to oversee Tōkaidō Shinkansen. “At the time of the bullet train project in 1939 I mentioned before, they were already planning to design trains which have [a max speed of] 125 mph. [The] engineer of Shinkansen had the clear aim of tying Tokyo to Osaka by 3 hours from the beginning, and [the] prototype called ‘Series 1000’ achieved 256 km/h (160 mph) in 1963.”


their own workflow  Fishman, “Engines of Democracy,” 33.
goal would have done that  In an email responding to fact-checking questions, a spokesman for General Electric wrote that “the Durham plant was created with the flexibility to make such dramatic change[s]. Many adjustments were in process when the plant was opened in 1992. Durham from its inception was created as an ‘incubator’ for new manufacturing practices at GE Aviation. Yes, Jack [Welch] set the bar high—but given the aggressive competition in the aviation business, these goals were a requirement to be successful and to generate the kind of income necessary to fund new engine developments at that time (namely the GE90).”
“broad search, or playfulness”  Sitkin et al., “Paradox of Stretch Goals,” 544–66.
the researchers wrote  Jeffrey, Webb, and Schulz, “The Effectiveness of Tiered Goals Versus Stretch Goals.”
University of Waterloo  Ibid.


“You are lying!” Ibid.

CHAPTER FIVE: MANAGING OTHERS


137 Melton’s daughters Some observers of the Janssen case have suggested that authorities used a device known as a “stingray,” which can identify the precise location of a cellphone, in this investigation. The FBI, when asked about use of a stingray in this case, replied with a response the agency has provided about cell site simulators to other media requests: “Location information is a
vital component of law enforcement investigations at the federal, state and local levels. As a general matter, the FBI does not discuss specific techniques used by law enforcement to obtain location information, as they are considered Law Enforcement Sensitive, the public release of which could harm law enforcement efforts at all levels by compromising future use of the technique. The FBI only collects and maintains information that has investigative value and relevance to a case, and such data [are] retained in accordance with controlling federal law and Attorney General policy. The FBI does not keep repositories of cell tower data for any purpose other than in connection with a specific investigation. The collection of cell tower records is only performed after required FBI approvals are received in the specific investigation, and only after the appropriate order is obtained from a court. If the records obtained are deemed relevant, the specific records are made part of the investigative case file. The FBI retains investigative case files in accordance with NARA-approved file retention schedules. If the FBI believes the use of any technology or technique may provide information on an individual where case law dictates that person has a reasonable expectation of privacy, it is FBI policy to obtain a search warrant."

137 directed by Melton himself As noted in the chapter, the details regarding Kelvin Melton, Tianna Brooks (who also allegedly goes by the name Tianna Maynard), and other alleged kidnappers or those allegedly connected to the Janssen kidnapping are contained in court documents or interviews. At the time of writing, Melton, Brooks, and others implicated in this crime have been indicted, but have not gone to trial. Until a trial is conducted and a verdict rendered, allegations remain just that, allegations, and the crimes described in this chapter have not been proven in a court of law. In January 2016, Melton told a court that he was not responsible for the Janssen kidnapping. Other alleged kidnappers are also expected to deny responsibility or guilt. Melton’s attorneys, as well as Brooks’s attorney, were presented with synopses of all details in this chapter and asked to inquire if their clients, who are incarcerated on other charges or awaiting trial, wished to respond. Brooks’s lawyer did not reply. Melton’s lawyer, Ryan D. Stump, in an email wrote: “We are under a court order not to discuss the details of Mr. Melton’s case and what is contained in the discovery. Unfortunately, due to the restrictions, we are not able to make any comments on the case.”

138 predecessors decades before In response to a fact-checking email, a spokeswoman for the FBI said that the bureau’s system prior to Sentinel, in addition to using index cards, also used an electronic indexing system. Interviews with agents confirmed this, but said that the electronic system was often incomplete and thus unreliable.

138 rolled out Sentinel In response to a fact-checking email, a spokeswoman for the FBI detailed Sentinel this way: “Sentinel is a tool that manages
Sentinel provides a piece of the puzzle. It documents the FBI’s work products and is used in conjunction with information we collect or access through other partnerships in order to further data.”


139 “aphrodisiac in Northern California” Rick Madrid passed away in 2012. For my understanding of Mr. Madrid, NUMMI, and General Motors, I am deeply indebted to Frank Langfitt of National Public Radio, Brian Reed of This American Life, and other reporters from various newspapers and media organizations who were kind enough to share notes and transcripts with me, as well as Madrid’s former colleagues, who shared memories of him. Details on Madrid, including his quotes, draw on a variety of sources, including tapes of interviews with him, notes and transcripts from interviews he gave to other reporters, and recollections of colleagues. In addition, I relied upon Harry Bernstein, “GM Workers Proud of Making the Team,” Los Angeles Times, June 16, 1987; Clara Germani, “GM-Toyota Venture in California Breaks Tradition, Gets Results,” The Christian Science Monitor, December 21, 1984; Michelle Levander, “The Divided Workplace: Exhibit Traces Battle for Control of Factory,” Chicago Tribune, September 17, 1989; Victor F. Zonana, “Auto Venture at Roadblock: GM-Toyota Fremont Plant Produces Happy Workers, High-Quality Product—and a Glut of Unsold Chevrolet Novas,” Los Angeles Times, December 21, 1987; “NUMMI,” This American Life, WBEZ Chicago, March 26, 2010; Charles O’Reilly III, “New United Motors Manufacturing, Inc. (NUMMI),”
Notes


140 the Fremont plant In a statement sent in response to fact-checking questions, a spokesman for Toyota wrote: “Toyota can’t speak to any of the descriptions of the Fremont facility while it operated prior to the independent joint venture with GM. While the broad descriptions of Toyota’s philosophy and certain historical facts are consistent with our approach and understanding of events—such as the use of the andon cord, the trip for former GM workers to Japan and the improvement in product quality following the formation of NUMMI—we are unfortunately unable to confirm or provide any other feedback on the specific accounts you provide. However, we can provide the following statement from the company on the NUMMI joint venture, which you are welcome to use if you so choose: ‘NUMMI was a groundbreaking model of Japan-U.S. industry collaboration, and we are proud of all its considerable achievements. We remain grateful to all of those involved with NUMMI,
including the suppliers, the local community and, most of all, the talented team members who have contributed to the success of this pioneering joint venture.’” In a statement, a spokeswoman for General Motors wrote: “I can’t comment on the specific points you shared re the experience at Fremont and NUMMI in the early 1980s, but I can absolutely confirm that is not the experience in GM plants today. . . . GM’s Global Manufacturing System is a single, common manufacturing system that aligns and engages all employees to use best processes, practices and technologies to eliminate waste throughout the enterprise. . . . While it is true that GMS has its roots in the Toyota Production System (TPS) that was implemented at NUMMI in 1984, many components of GMS grew out of our efforts to benchmark lean manufacturing around the world. . . . While all principles and elements are considered crucial to the successful implementation of GMS, one principle is key to GMS’s adaptability, and that is Continuous Improvement. By engaging our employees, we have seen them use GMS to improve our production systems, ensure a safer work environment and improve product quality for our customers.”

140 low costs in Japan In a fact-checking email, Jeffrey Liker, who has studied and written extensively about Toyota, wrote: “Toyota realized that to be a global company they needed to set up operations overseas and they had little experience doing it outside of sales. They believed that the Toyota Production System was vital to their success and it was highly dependent on people deeply understanding the philosophy and continuously improving in an environment of trust. They saw NUMMI as a grand experiment to test whether they could make TPS work in the United States with American workers and managers. In fact, in the original agreement with GM they planned on only making Chevy vehicles and when these did not sell because of the negative image of the Chevy brand they brought over the Toyota Corolla. For GM the main attraction was to get some small cars built of good quality profitably and learn how to do this. They seemed to have a passing interest in TPS. For Toyota NUMMI was considered a critical milestone to their future and they studied what was happening every single day to learn as much as they possibly could about operating in the US and developing the Toyota culture overseas.”

145 prove their assertion right In response to a fact-checking email, Baron wrote: “Our focus was a bit broader than ‘culture.’ We were interested in how founders’ early choices about organizational design and structuring of employment relationships affected the evolution of their nascent enterprises.”

145 “answer a questionnaire” In response to a fact-checking email, Baron wrote that the sources they turned to exceeded just the San Jose Mercury News: “We scoured a variety of sources, including the ‘Merc,’ to try to identify evidence of new foundings. That was supplemented by industry listings from companies like CorpTech (which focuses on marketing targeted to small
tech companies). From these sources we put together listings of companies by subsector (biotechnology, semiconductors, etc.). Then we sampled from those listings, seeking to get a representative sampling of firms in terms of age, venture-backed versus not, etc. Somewhat later, after ‘the Internet’ had emerged as a discernible sector, we replicated the research design focusing specifically on that sector, to see if things were similar or different among the new net companies from the others that we had been studying, and we found the patterns were the same.”


146 collected enough data In response to a fact-checking email, Baron wrote: “Perhaps this is nit-picking, but what we were looking at were firms whose founders had similar cultural ‘blueprints’ or premises underlying their creation. I emphasize this because we were not using observable practices as the basis for differentiation, but instead the way in which founders thought and spoke about their nascent enterprises.”

146 one of five categories There were also a sizable number of firms that did not fit neatly into any of the five categories.

147 on the same path” In response to a fact-checking email, Baron said that he should not be considered an expert on Facebook, and that participants in the study were promised anonymity. He added: “We found that engineering firms fairly frequently evolved, either into bureaucracies or into commitment firms. Those transitions were much less disruptive than others, suggesting that one reason for the popularity of the engineering blueprint at start-up is that it is amenable to being ‘morphed’ into a different model as the firm matures.”

147 “You get paid,” Baron said Baron, in response to a fact-checking email, said that the bureaucratic and the autocratic models have differences but are similar in that “(1) they are both quite infrequent within this sector
among start-ups; and (2) they are both unpopular with scientific and technical personnel.”

148 successful companies in the world The researchers promised confidentiality to companies that participated in the study, and would not divulge specific firms they had studied.


150 “strong advantage” In response to a fact-checking email, Baron expanded upon his comments: “What this doesn’t explicitly capture is that commitment firms tended to compete based on superior relationships with their customers over the longer term. It is not just relationships with salespeople, but rather that stable teams of technical personnel, working interdependently with customer-facing personnel, enable these companies to develop technologies that met the needs of their long-term customers.”


151 preserve their jobs In a fact-checking email, Jeffrey Liker wrote that Toyota’s head of human resources had told a UAW representative that “before laying off any workers they would insource work, then management would take a payout and then they would cut back hours before considering layoffs. In return he said the union needed to agree on three things: 1) competence would be the basis for workers advancing, not seniority, 2) there had to be a minimum of job classifications so they had the flexibility to do multiple jobs, and 3) management and the union would work together on productivity improvements. Within the first year the Chevy Nova was not selling well and they had about 40% too many workers and they kept them all employed in training and doing kaizen for several months until they could get the Corolla into production.”


155 shared power It is important to note that, despite NUMMI’s success, the company was not perfect. Its fortunes were tied to the automotive industry, and so when overall car sales declined, NUMMI’s profits dipped as well. The NUMMI factory was more expensive to operate than some low-cost foreign
competitors, and so there were stretches when the firm was undersold. And when GM tried to export NUMMI’s culture to other plants, they found, in some places, it wouldn’t take. Enmities between union leaders and managers were simply too deep. Some executives refused to believe that workers, if empowered, would use their authority responsibly. Some employees were unwilling to give GM the benefit of the doubt.

155 “devoted to each other” When the Great Recession hit the automotive industry, NUMMI was one of the casualties. GM, headed toward bankruptcy because of liabilities in other parts of the company, pulled out of the NUMMI partnership in 2009. Toyota concluded it couldn’t continue to operate the plant on its own. NUMMI closed in 2010, after manufacturing nearly eight million vehicles.


Notes  341


158 plan everything in advance This method of planning is often known as a “waterfall approach,” because it is a sequential design methodology in which progress “flows” downward from conception to initiation, analysis, design, construction, testing, production/implementation, and maintenance. At the core of this approach is the belief that each stage can be anticipated and scheduled.

158 unfettered themselves In response to a fact-checking email, Fulgham expanded his comments: “I assigned the CTO (Jeff Johnson) as the day to day executive for oversight. We hired an Agile Scrum Master (Mark Crandall) to serve as a coach and mentor (not as a project manager). We created an open physical workspace in the basement that allowed collaborative communications between team members. We assigned three Cyber Special Agents as the front end development leads, and the Director, Deputy Director and I empowered them to recommend any process improvements and/or form consolidations (in order not to just digitize any potentially outdated processes/forms). I worked with the CEOs of our top vendors for the products that were going to make up Sentinel to get their support and their best cleared personnel. The team adopted (under Mark’s coaching) the agile methodology. All FBI stakeholders were part of the business side of the Sentinel team to ensure their needs were met. The technical team conducted self directed two-week sprints. We had nightly automated builds. A dedicated QA team was located
with the development team, and I held a meeting every two weeks to view fully functional code (no mockups) and personally signed off on requirements. All stakeholders, the DOJ, the DOJ IG, the White House and other interested government agencies, attended these demo days to observe our progress and process."

160 solve thousands of crimes In response to a fact-checking email, a spokeswoman for the FBI wrote, regarding Sentinel: “We are not predicting crime. We may identify trends and threats.”


CHAPTER SIX: DECISION MAKING

167 worth $450,000 Throughout this chapter, chips are referred to by their notional dollar value. However, it is important to note that in tournaments like this one, chips are tokens that are collected to determine winners—they are not traded in for cash on a one-to-one basis. Rather, prize money is paid out based on how someone places in the competition. So someone could have $200,000 in chips and take fifth place in a tournament and win $300,000, for instance. In this particular tournament, the prize was $2 million and, by coincidence, the total number of chips was also $2 million.

Notes


174 a million television viewers The tournament drew an estimated 1.5 million viewers.

174 She’s not sure Annie, in a phone call to check facts in this chapter, expanded upon her thinking: “If Greg had jacks or better, I was in a bad situation. I was very undecided about the hand he could be holding, and I was in a situation where I really did have to create more certainty for myself. I really needed to decide if he had aces or kings, and then fold. Also, Greg Raymer, at that point, was an unknown quantity, but my brother and I had been watching videotapes of him play, and we had seen what we thought was a “tell,” something he did physically when he had a good hand, and I saw him do this particular thing that suggested to me that he had a strong hand. That’s not a certain thing, you don’t know if a tell is 100 percent, but it helped tip me into thinking he had a strong hand.”


A group of  At various points during the GJP, the precise number of researchers involved fluctuated.

questions as the experts  In response to a fact-checking email, Barbara Mellers and Philip Tetlock, another of the GJP leaders, wrote: “We had two different types of training in the first year of the tournament. One was probabilistic reasoning and the other was scenario training. Probabilistic reasoning worked somewhat better, so in subsequent years, we implemented only the probabilistic training. Training was revised each year. As it evolved, there was a section on geopolitical reasoning and another on probabilistic reasoning. . . . Here is a section that describes the training: We constructed educational modules on probabilistic-reasoning training and scenario training that drew on state-of-the-art recommendations. Scenario training taught forecasters to generate new futures, actively entertain more possibilities, use decision trees, and avoid biases such as over-predicting change, creating incoherent scenarios, or assigning probabilities to mutually exclusive and exhaustive outcomes that exceed 1.0. Probability training guided forecasters to consider reference classes, average multiple estimates from existing models, polls, and expert panels, extrapolate over time when variables were continuous, and avoid judgmental traps such as overconfidence, the confirmation bias, and base-rate neglect.
Each training module was interactive with questions and answers to check participant understanding.”

177 abilities to forecast the future In response to a fact-checking email, Don Moore wrote: “On average, those with training did better. But not everyone who got trained did better than all the people who did not get it.”

180 tremendously useful Brooks, “Forecasting Fox.”

181 things you aren’t sure about In response to a fact-checking email, Don Moore wrote: “What makes our forecasters good is not just their high level of accuracy, but their well-calibrated humility. They are no more confident than they deserve to be. It’s ideal to know when you have forecast the future with accuracy and when you haven’t.”

183 or roughly 20 percent In an email, Howard Lederer, a two-time World Series of Poker champion, explained the further nuances required in analyzing this hand: “The hand you use as an example is MUCH more complicated than it appears.” Given what’s known, Lederer said, there is actually a better than 20 percent chance of winning. “Here’s why. If you KNOW your opponent has an A or a K, then you know seven cards. Your two [cards], your opponent’s one card, and the four [communal cards] on the board. This means there are 45 unknown cards (you have no information on your opponent’s other card). This would mean you have nine hearts to win, and 36 non-hearts to lose. The odds would be 4 to 1, or 1 in 5. The percentages are 20%. As long as you are not putting more than 20% of the money into the pot, it’s a good call. Here’s where you might ask: if I am only 20% to win against an A or K, then how can I be better than [20%] to win? Your opponent might not have an A or K! He could have a spade flush draw without an A or K, he could have a straight draw with a 5–6. He could have a lower heart draw. That would be great for you! There’s also a chance he just has garbage and is trying to bluff you with nothing. In general, I’d calculate the chances that your opponent has one of these drawing or bluffing hands at about 30% (given how many of these possibilities there are). So let’s do some probabilistic math: 70% of the time he has an A or K, and you win 20% of those times. 25% of the time he has a draw and you win about 82% of those hands (I’m combining various possible odds given his range of holdings when he is drawing). And 5% of the time he has a total bluff and you win 89% of the time when he has garbage. Your total chances of winning are: (.7 × .2) + (.25 × .82) + (.05 × .89) = 39%! This is a simple ‘expected value’ calculation. You can see that the .7, .25 and .05 part of the calculation adds up to 1. Meaning we have covered all the possible holdings and assigned them probabilities. And we are making our best guess as to our chances against each holding. At the table, you don’t have time to do all the math, but ‘in your gut’ you can feel the odds and make the easy call.
One other note, if you miss your flush and your opponent bets, you should seriously consider calling anyway. You will be getting well over 10–1, and the chances he is bluffing are probably higher than that. This is just a simple taste of the complexity of poker.


185 “odds work for you” In response to a fact-checking email, Howard Lederer wrote: “It’s more complex than that. Amateurs players make many different kinds of errors. Some play too loose. They crave the uncertainty and favor action over prudence. Some players are too conservative, favoring a small loss in a hand over taking the chance to win, but also the chance to take a large loss. Your job as a poker pro is to simply play your best each hand. In the long run, your superior decisions will defeat your opponent’s poor decisions, whatever they may be. The societal value of poker is that it is a great training ground for learning sound decision-making under conditions of uncertainty. Once you get the hang of playing poker, you develop the skills necessary to make probabilistic decisions in life.”

185 Annie’s brother, Howard Though it does not bear on the events described in this chapter, disclosure compels mentioning that Lederer was a founder and board member of Tiltware, LLC, the company behind Full Tilt Poker, a popular website that was accused of bank fraud and illegal gambling by the U.S. Department of Justice. In 2012, Lederer settled a civil lawsuit with the Department of Justice related to Full Tilt Poker. He admitted no wrongdoing, but did agree to forfeit more than $2.5 million.

186 winning this hand Technically, Howard has an 81.5 percent chance of winning—however, because it is hard to win half a hand of poker, this has been rounded up to 82 percent.

187 remaining cards on the table In response to a fact-checking email, Howard Lederer wrote: “I would say that in a 3 handed situation, [a pair of sevens] is close to 90% to be best before the flop. This is the hand where I agree anyone would have played her hand and my hand the same way; all in before the flop. After we had all the money in, I am not a slight favorite, but instead a large favorite. This [is] a unique feature of hold’em. If you have a slightly better hand than your opponent, you are often a big favorite. 7–7 is about 81% to beat 6–6.”

188 “they tell you might occur” In response to a fact-checking email, Howard Lederer wrote: “It’s not an easy thing to choose a profession where you
lose more often than you win. One has to focus on the long run, and realize that if you get offered 10–1, on enough 5–1 shots, you will come out ahead, while also realizing that you will lose 5 out of 6 times."

188 **humans process information** Tenenbaum, in an email responding to fact-checking questions, described his research this way: “Often we start with what looks like a gap between humans and computers, where humans are outperforming standard computers with intuitions that may not look like computations. . . . But then we try to close that gap, by understanding how human intuitions actually have a subtle computational basis, which then can be engineered in a machine, to make the machine smarter in more human-like ways.”


189 **“examples of each?”** Ibid.

191 **(which has no strong pattern)** In an email responding to fact-checking questions, Tenenbaum said that many of the examples they used were fairly complex, and “the reasons for the prediction functions having these shapes are the combination of (1) the priors, plus (2) a certain assumption about when an event is likely to be sampled (the ‘likelihood’), (3) Bayesian updating from priors to posteriors, and (4) using the 50th percentile of the posterior as the basis for prediction. What’s correct about what you have is that in our simple model, only (1) varies across domains—between movies, representatives, life spans, etc.—while (2–4) are the same for all the tasks. But [it’s] because of these causal processes (which vary across domains) together with the rest of the statistical computations (which are the same across domains) that the prediction functions have the shape they do.” It is important to note that the graphs in this text do not represent accurate empirical results, but rather patterns of predictions—the estimations that represent the 50th percentile of being right or wrong.

191 **You read about a movie** These are summaries of the questions asked. The direct wording of each question was: “Imagine you hear about a movie that has taken in 60 million dollars at the box office, but don’t know how long it has been running. What would you predict for the total amount of box office intake for that movie?” “Insurance agencies employ actuaries to make predictions about people’s life spans—the age at which they will die—based upon demographic information. If you were assessing an insurance case for a 39-year-old man, what would you predict for his life span?” “Imagine you are in somebody’s kitchen and notice that a cake is in the oven. The timer shows that it has been baking for 14 minutes. What would you predict for the
total amount of time the cake needs to bake?” “If you heard a member of the House of Representatives had served for 11 years, what would you predict his total term in the House would be?”

192 variation of Bayes’ rule In an email responding to fact-checking questions, Tenenbaum wrote that “the most natural way to make these kinds of predictions in computers is to run algorithms which effectively implement the logic of Bayes’ rule. The computers typically don’t explicitly ‘use’ Bayes’ rule, because the direct computations of Bayes’ rule are typically intractable to carry out except in simple cases. Rather the programmers give the computers prediction algorithms whose predictions are made to be approximately consistent with Bayes’ rule in a wide range of cases, including these.”


195 skewed, as well “Base rate” typically refers to a yes-or-no question. In the Tenenbaum experiment, participants were asked to make numerical predictions, rather than answer a binary question, and so it’s most accurate to refer to this assumption as a “prior distribution.”

195 failures we’ve overlooked In an email responding to fact-checking questions, Tenenbaum wrote that “It’s not clear from our work that predictions for events in a certain class improve progressively with more experience with events of that type. Sometimes they might, sometimes they don’t. And this is not the only way to acquire a prior. As the pharaohs example shows, and other projects by us and other researchers, people can acquire a prior in various ways beyond direct experience with a class of events, including being told things, making analogies to other classes of events, forming analogies, and so on.”


198 “bluff when it matters” In response to a fact-checking email, Hellmuth wrote: “Annie is a great poker player, and she has stood the test of time. I respect her, and I respect her Hold’em game.”

199 He folds In response to a fact-checking email, Hellmuth wrote: “I think she was trying to tilt me (get me emotional and upset) by showing a nine in that situation. A lot of players would have gone broke with my hand there (top pair) with a ‘Safe’ turn card, but I’ve made a living deviating from the norm and trusting my instincts (my white magic, my reading ability). I trusted it and folded.”

201 middle of the table In response to a fact-checking email, Hellmuth wrote: “With the chips I had at that time I had to go all in with 10–8 on that
flop (I had top pair and there were flush draws, and straight draws possible). Completely standard. If you're trying to imply that I put the money because I was emotionally tilted, you're wrong. Nothing I could do there.”

202 Phil is out In response to a fact-checking email, Hellmuth contends that he and Annie had struck a deal when the tournament came down to the two of them in which they pledged to guarantee each other $750,000 regardless of the winner, and play for the last $500,000. Annie Duke confirmed this deal.

CHAPTER SEVEN: INNOVATION


207 **surprised by all the criticisms** In an email sent in response to fact-checking questions, Andrew Millstein, president of Disney Animation Studios, wrote: “These are the kind of notes that fuel our creative process and help propel the forward progress of all of our films in production. The creative leadership on any film often gets too close to their films and loses objectivity. Our Story Trust functions like a highly critical and skilled audience that can point to flaws in the story-telling and, more important, provide potential solutions. . . . You’re describing a process of experimentation, exploration and discovery that are key components of all our films. It’s not a question of if this will happen, but to what degree. This is a constant part of our process and the expectation [of] every filmmaking team. It is what contributes to the high standards that our films set.”

207 **Book of Mormon** In an email sent in response to fact-checking questions, Bobby Lopez made clear that Kristen was a sounding board for him in writing Avenue Q and Book of Mormon but was not formally credited on those shows.

208 **dozens of others popped up** In an email sent in response to fact-checking questions, a spokeswoman for Walt Disney Animation Studios wrote that the studio wished to emphasize “how typical this process is for every film at Disney Animation since John [Lasseter] and Ed [Catmull] have become our studio leaders—the screening process, the notes sessions, the taking apart of the film and putting it back together. This is typical, not atypical.”

209 **“good ideas are suffocated”** In an email sent in response to fact-checking questions, Ed Catmull, president of Disney Animation, wrote that the various anecdotes in this chapter are “viewpoints of different snapshots in time as the film developed. . . . In truth, you could substitute different words and it would pretty much describe how every film goes through searching and change. This is worth emphasizing so that people don’t have the impression that Frozen was different in that way.”

209 **Frozen was winding down** In an email sent in response to fact-checking questions, Millstein wrote: “Creativity needs time, space and support to fully explore multiple ideas simultaneously. Our creative leadership has to have the confidence and trust in each other to experiment, fail and try again and
again until the answers to story questions and problems get better and more refined. There also needs to be a relentless focus on finding the best solutions to difficult and thorny problems and never settling for sub-optimum solutions because of time issues. Our creative teams need to trust that the executive management fundamentally believes in and supports this process.”

There are a few outliers to this musical formula, most notably Oklahoma!, in which dance was used to express plot and emotional moments.


would be West Side Story West Side Story went through numerous names before the final title was chosen.

musical's main characters Excerpts of letters come from the Leonard Bernstein Collection at the Library of Congress as well as from records made available by various authors and the New York Public Library system.

“jitterbugging” This was written by Leonard Bernstein, as quoted in *The Leonard Bernstein Letters* (New Haven, Conn.: Yale University Press, 2013).

“we're boring the audience” Jerome Robbins, as quoted in *The Leonard Bernstein Letters* (New Haven, Conn.: Yale University Press, 2013).

two intermissions Vaill, *Somewhere.*

“Shakespeare standing behind you” Ibid.


In response to a fact-checking email, Uzzi wrote: “The other thing is that teams are more likely to get this sweet spot of creativity right. They are more likely than individuals to put together atypical combinations of prior sources. Also, a paper with the right mix of conventional and atypical ideas by a team does better than a single author, given the same mix of conventional and atypical ideas. This means teams are better than individuals at sourcing and deriving insights from atypical combinations.”


215 **succeeded somewhere else** In an email sent in response to fact-checking questions, Burt wrote: “Managers offered their best idea for improving the value of their function to the company. The two senior executives in the function evaluated each idea (stripped of personal identification). The summary evaluation of each idea turned out to be primarily predicted by the extent to which the person who articulated the idea had a network that reached across boundaries (structural holes) between network groups, functions, divisions in the company.”


216 **plot’s central tensions** I am indebted to the New York Public Library for making an early draft version of the *West Side Story* script available to me. This is an abridgment of that script, shortened for ease of representation.
219 communicated through dance This text is a combination of finished versions of the West Side Story script, Robbins’s notes, and interviews providing a description of the choreography from the first staging of the show and other sources.


220 the original Maria Fishko, “Real Life Drama Behind West Side Story.”

221 coffee cups and to-do lists The Frozen core team included Buck, Lee, Del Vecho, Bobby Lopez and Kristen Anderson-Lopez, Paul Briggs, Jessica Julius, Tom MacDougall, Chris Montan, and, at times, others from various departments.

222 upstate New York In an email sent in response to fact-checking questions, a spokeswoman for Walt Disney Animation Studios wrote that Lee “and her sister fought, as kids do; they grew together as they grew older. They were never estranged. . . . In college, they became close. They lived together in NYC for a while, even.”

223 “ourselves on the screen” In an email sent in response to fact-checking questions, Millstein wrote: “Solutions to story issues [are often] connected to personal emotional experiences. We draw from our own stories, history and emotional lives as a wellspring of inspiration. . . . We also draw on the experiences of others throughout the studio and deep research into specific areas that a film may attempt to explore. In the case of Frozen, we had a built-in research group at Disney Animation: employees who are sisters. They can describe firsthand what it’s like to have a sister as a sibling and the life experiences they’ve had. This is wonderful firsthand source material.”


223 “pushed to use it sometimes” In an email sent in response to fact-checking questions, Catmull wrote: “It is too simple to say that people need to be pushed. Yes, they do, but they also need to be allowed to create, and we must make it safe for them to find something new. Andrew and I both need to be a force to make things move along, while at the same time, trying to keep fear from slowing them down or getting stuck. This is what makes the job so hard.”


226 of people’s expectations  In an email sent in response to fact-checking questions, Bobby Lopez wrote: “From our perspective—we hit ‘send’ on an email with our mp3 attached, and then count the minutes, hours, or sometimes days before we hear back from them. Sometimes it means something and sometimes it doesn’t. We didn’t hear back right away, so we began to doubt the song, but when they did call us it was clear they were very excited.”

226 “feel like one of us”  In an email sent in response to fact-checking questions, a spokeswoman for Walt Disney Animation Studios wrote that Lee “had written a draft of the script already in April [2012 in] which Elsa was a more sympathetic character but there was still a plan for her to turn evil halfway through the film. [“Let It Go”] first appeared in [an] August 2012 screening. “Let It Go” helped shift the tone of the Elsa character. It should be noted that John Lasseter felt a personal tie to this as well—when thinking of Elsa, he thought of his son, Sam, and his juvenile diabetes. When Sam was getting poked and prodded as a child, he turned to John and said, ‘Why me?’ It wasn’t Sam’s fault he had diabetes, just as it is not Elsa’s fault she has these icy powers.”

226 “It had to feel real”  In an email sent in response to fact-checking questions, a spokeswoman for Walt Disney Animation Studios wrote that Chris Buck had a vision for how the film would end. “The ending—making it work emotionally[—]was a puzzle. By October 2012, Jennifer had the ending envisioning the four main characters in a blizzard of fear, which story artist John Ripa boarded. Ripa’s boards received a standing ovation from John Lasseter in the room. As Jennifer says, ‘We knew the end, we just needed to earn it.’”

227  “Lee a second director” In an email sent in response to fact-checking questions, Catmull wrote that it is important to emphasize that Lee was a second director, not a “codirector,” which has multiple meanings in Hollywood. “There is an actual title of ‘Co-director’ which is at a lower level than ‘director.’ At Disney we frequently have two directors who both have the title of ‘director.’ In this case, both Jenn and Chris were equal directors. . . . Jenn was made director along with Chris.”

228  spinning in place In an email sent in response to fact-checking questions, Millstein wrote: “Jenn’s promotion to an equal directing partner with Chris provided an opportunity to alter the team dynamics in a positive way and their receptivity to potential new ideas. . . . Jenn is a very sensitive and emphatic filmmaker. Her sensitivity to team dynamics, her role and voice and deep need to maintain a deep collaboration is what helped make Frozen successful.” One additional factor influencing the decision to promote Lee to director, according to Buck, was that at that time, one of his children had a health issue that required attention, and as a result “John and Ed and Andrew saw my personal need, and they asked me, right before, what would you think of having Jenn as a co-director? And I said yes, I said absolutely, I would love that.”

228  ecologically bland I am indebted to the help of Stephen Palumbi of Stanford’s Hopkins Marine Station and Elizabeth Alter of the City University of New York for their assistance in my understanding of the intermittent disturbance hypothesis.


230  intermediate disturbance hypothesis Like many scientific theories, the intermediate disturbance hypothesis has many parents. For a more complete history, please see David M. Wilkinson, “The Disturbing History of Intermediate Disturbance,” Oikos 84, no. 1 (1999): 145–47.


Notes 359


233 Lee sat down with John Lasseter In an email sent in response to fact-checking questions, Catmull wrote that figuring out *Frozen*’s ending was a team effort. John Ripa, an animator at Disney, storyboarded the ending. “This was a powerful and influential part of the development of the story. . . . [In addition] there was a particularly impactful offsite where a great deal of progress was made.”

234 “tell the team,” said Lasseter In an email sent in response to fact-checking questions, a spokeswoman for Walt Disney Animation Studios wrote: “Jennifer feels this is very, very important: This was a story Jennifer and Chris did together. This was a partnership. [The emails] Kristen shared were based on conversations Jennifer was having with Chris daily. Chris is just as much a part of these conversations as Jennifer, Kristen and Bobby. . . . This is [Chris Buck’s] film, first and foremost.”

CHAPTER EIGHT: ABSORBING DATA

238 multiplication quiz “Dante Williams” is a pseudonym used to protect the privacy of a student who was a minor when these events occurred.


240 the “Elementary Initiative” Information on the EI and other Cincinnati Public Schools reforms came from various sources, including Kim McGuire, “In Cincinnati, They’re Closing the Achievement Gap,” *Star Tribune*, May 11,

241 how to use it The Cincinnati Public School system's Elementary Initiative had other components in addition to instructing teachers in how to use data. Those included using data and analysis to guide evidence-based decisions; implementing a new principal evaluation system aligned to the district's strategic plan that included student performance scores; expanding school-site learning teams of teachers to build capacity in all schools; training primary and intermediate content specialists in core subjects; and becoming more family friendly and community engaged. “Using data and evidence, we
will improve practice, differentiate instruction, and track learning results for every student,” the district wrote in a summary of the initiative. “Our goal is to create a collaborative learning culture that involves families, is embraced in schools and is supported by the Board, central office and the community. Such a culture is at the heart of the elementary school initiative. . . . Just as the medical community uses diagnostics to determine treatment for critical care patients, so are we using data and analysis with 15 critical care schools to reshape training, support and delivery of services aligned to the academic, social and emotional needs of the students.” (“Elementary Initiative: Ready for High School,” Cincinnati Public Schools, 2014, http://www.cps-k12.org/academics/district-initiatives/elementary-initiative.) It is also worth noting that, though everyone spoken to in reporting this chapter credits a data-driven approach with fueling South Avondale’s transformation, they also noted that such changes were possible only because of strong leadership at the school and commitment from teachers.

241 **inner-city reform** “Elementary Initiative: Ready for High School.”


243 **blanket of powder** Snow blindness can also refer to a burn of the cornea, which is the front surface of the eye, by ultraviolet B rays.

243 **enroll in 401(k) plans** Sheena S. Iyengar, Gur Huberman, and Wei Jiang, “How Much Choice Is Too Much? Contributions to 401(k) Retirement

244 **more than thirty plans** In an email sent in response to fact-checking questions, Tucker Kuman, a colleague of the paper’s lead author, Sheena Sethi-Iyengar, wrote: “What was observed in the analysis was that, everything else being equal, every ten funds added was associated with a 1.5 percent to 2 percent drop in employee participation rate (peak participation—75%—occurred when 2 funds were offered). . . . As the offerings increased in number, the decline in participation rates is exacerbated. If you look at the graphic representation [Figure 5–2 in the paper] of the relationship between participation and number of funds offered, you’ll notice we begin to see a steeper decline in participation rates when the number of funds hits about 31.”


In an email sent in response to fact-checking questions, Adam Alter, a professor at NYU who has studied disfluency, explained disfluency as “the sense of mental difficulty that people experience when they try to process (make sense of) certain pieces of information—complex words; text printed in ornate fonts; text printed against background of a similar color; drawing dimly remembered ideas from memory; struggling to remember a phone number; etc. You don't have to be manipulating or using data, per se, for an experience to be disfluent. Some of this turns on how you define data—it sounds like you're defining it very broadly, so perhaps your definition comes close to mine if you think of every cognitive process as 'using data.'”

Alter wrote in an email that some recent work “challenges the disfluency literature. . . . Some of my friends/colleagues have written another piece ["Disfluent Fonts Don’t Help People Solve Math Problems"] that shows how finicky the effect is; [and] how hard it can be to replicate at least one of the effects (the cognitive reflection test effects).”

In an email sent in response to fact-checking questions, Adam Alter expanded on his quote to note that disfluency causes learning to be “longer lasting, perhaps, but certainly deeper. We don’t comment much on decay rates—how long the information is retained—but it probably follows that ideas last longer when they're processed more deeply. . . . The more they elaborate on that information, the more they tend to remember it. That's a general principle from cognitive psychology. If I ask you to remember the word ‘balloon,’ you'll remember it more easily if, at the point of storing it in memory, you imagine a red balloon floating into the sky, or you think of a baboon carrying a balloon, or you otherwise do more than just trying to cram the word into your already overstuffed memory bank.”

Chase Manhattan Bank, now known as JPMorgan Chase, was provided with a summary of all facts contained in this chapter. A representative for the company wrote: “Given that more than 15 years have passed [since] the merger of Bank One and J. P. Morgan Chase in 2004, it's been difficult to find the right internal sources for this.”

In an email sent in response to fact-checking questions, Fludd wrote that there were other elements to her management style that she believes contributed to her success: “I also was able to identify that the collectors had different learning styles that caused them to interpret the data in different ways that could either negatively or positively impact their performance. . . . Management would accuse me of spoiling my collectors because sometimes I would cook them breakfast on the weekends. Food always helped. Being a minister often helped me relate to the collectors and assist them in ways that other managers couldn't. I would visit family members in
the hospital, perform marriages, prayer requests. Collectors knew I was a no
nonsense manager, but they also knew I cared about them... Knowing how
to interpret data and explaining it in a way that is meaningful and relevant
is important. The collectors having access to data that was relevant to their
performance was important. However if you cannot give the employee a road
map on how to take the data that they are receiving and show them how to
get to their desired performance destination, then it means nothing. How you
relay that data is just as important. The important thing every manager needs
to remember is not to forget the human side of the data they are relating."

252 **various experiments** In an email sent in response to fact-checking ques-
tions, Niko Cantor wrote: “It is also true that Charlotte was a better manager
than most peers, more engaging, more enrolling her people in a quest to be-
come better. She did make the job feel more like a game. I think some of
the effects of the collectors listening better and therefore connecting better
because the collectors were more engaged were important.”

253 **“So you’re Ms. Johnson**” Johnson started her teaching career at Pleasant
Hill Elementary, and then later joined South Avondale, serving as a teacher
couch.

255 **over the PA system** The “Hot Pencil Drills” were unique to South Avon-
dale, and not done in all of the schools participating in the Elementary Initiative.

256 **Delia Morris was a** “Delia Morris” is a pseudonym used to protect the
privacy of a student who was a minor when these events occurred.

258 **“the engineering design process”** Yousef Haik and Tamer Shahin, Engi-
neering Design Process (Independence, Ky.: Cengage Learning, 2010); Clive L.
Dym et al., Engineering Design: A Project-Based Introduction (New York: Wiley,
2004); Atila Ertas and Jesse C. Jones, The Engineering Design Process (New York:
Wiley, 1996); Thomas J. Howard, Stephen J. Culley, and Elies Dekoninck, “De-
scribing the Creative Design Process by the Integration of Engineering Design

258 **teacher’s manual explained** “What is the Engineering Design Process?”
intro-to-engineering/what-is-the-engineering-design-process.

261 **their own experiences** Stephen J. Hoch, “Availability and Interference
in Predictive Judgment,” Journal of Experimental Psychology: Learning, Mem-

261 **question was framed** In an email sent in response to fact-checking
questions, the author of this study, Stephen Hoch, wrote: “The only other
thing that I might add is that old ideas can get in the way of new ideas, cre-
ating interference and essentially blocking the thought process. One way to overcome the interference is to take a break so that the old ideas die down in terms of their salience."


262 “inside their heads” In response to a fact-checking email, Johnson wrote: “The idea is that we think of a subset of the relevant information.”


265 **the difference between students** Pam A. Mueller and Daniel M. Oppenheimer, “The Pen Is Mightier Than the Keyboard: Advantages of Longhand over Laptop Note Taking,” *Psychological Science* 25, no. 6 (2014).

265 **verbatim phrases** In a note sent in response to fact-checking questions, the first author of this study, Pam Mueller of Princeton, wrote: “Only because a lot of people (on the Internet) seem to assume that we didn’t randomly assign participants to groups, and therefore the conclusions are invalid, it might be worth mentioning that the two groups were, in fact, randomly assigned. We did ask students about their underlying note-taking preference, but due to small numbers of participants in certain conditions (e.g., longhand-prefering students at Princeton assigned to the laptop condition) we can’t draw strong conclusions about any interactions there. There is some suggestion that those who preferred longhand in their regular note taking were more effective than others when using a laptop (i.e., continuing to take shorter, non-verbatim notes). One thing to note is that a strong majority of students at Princeton reported that they generally took notes on a laptop, while a majority of UCLA students reported that they took notes longhand. It is heartening that our second study (run at UCLA) did replicate our first study (run at Princeton).”

265 **the lecture’s content** In a note sent in response to fact-checking questions, Mueller wrote: “Laptop note-takers had far more content in their notes. Thus, we thought that the laptop note-takers’ performance would rebound
when they had a chance to look back on their notes—the laptop note takers just had so much more information available at the time of study. However (as we were quite surprised to find), it seems that if they didn't process the information at the time of encoding (i.e., during the lecture), the increased quantity of notes didn't help, or at least didn't help within a short study period. Perhaps with a longer time to study, they could piece together the content of the lecture, but at that point, the process is pretty inefficient, and it would be better to have taken ‘better’ (i.e., longhand-style, with less verbatim overlap) notes the first time around.”