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Introduction

The brain is a wonderful organ: It starts
working the moment you get up in
the morning and does not stop until
you get into the office.

R O B E R T F R O S T

AS THIS BOOK WENT TO PRESS, AMAZON'S WEBSITE LISTED MORE THAN 36,000 books that have some connection to the brain. You can find books on how your brain grows and develops, what makes it happy or sad, how to keep it healthy, how it makes decisions, and how it can get you into trouble. There is definitely no dearth of information about the human brain, especially since the advent of imaging technology several decades ago. Brain books are in vogue. But with so much information available, where do you start? *Brainwork* compiles and condenses this information, throwing out the half-truths and addressing common myths to provide you with the must-have information regarding the brain's inner processes and their applications to the workplace.

If you consider yourself a multitasker or believe the old shibboleth that "knowledge is power," you're in for a few surprises. Some of the new revelations in brain research run counter to long-held beliefs in organizational management. Gone are the days of "it's not personal; it's just business." Today's business world requires a closer look at emotional intelligence, and the best decision makers use both their emotional brains and rational brains. Multitasking is no longer considered a coveted trait but rather a hindrance to productivity. In fact, multitasking as we know it doesn't even really exist. And what happened to morality and ethical behavior? Have they gone the way of the dodo?

In the upcoming pages, we'll take a closer look at these subjects and explore ways to improve your thinking, control stress in the workplace, and lead by dissent. Of course, brain health is most important, so we've devoted a chapter to taking care of your brain, including what type of diet, what amount of exercise, and how much sleep are needed to maintain a healthy brain, especially as we grow older. Findings from brain research are suggesting strategies that can expand your existing cognitive networks and build new ones—in other words, make you smarter and more creative! Read on and find out how.

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C H A P T E R O N E

The Curse of Too Much Information

*Everybody gets so much information all day
long that they lose their common sense.*

G E R T R U D E S T E I N

AT THE VERY MOMENT I REALIZED I HAD TO BUY A NEW CAR, A COLD CHILL came over me. I had flashbacks to a similar event eight years earlier (I keep my automobiles for a while) that turned into unpleasant haggling and tiring drama. Frankly, entering a dentist's office for a root canal is less disturbing to me than entering a new-car showroom.

I was cheered by the thought that my decision on the car's make and model would be easier this time, given all the information one can find on the Internet about new cars. And so my hunt began. First, I compared ten models on the car manufacturers' sites, including trunk size, gas mileage, and dozens of options—fancy ones, such as seat warming and cooling, and not-so-fancy ones, such as GPS location technology and side air bags. Already the number of possible permutations of models and options was becoming enormous. Next, I looked at several dozen written and video reviews from people who already owned the cars. Regrettably, some reviews praised model A but trashed model B, whereas others did the reverse. Then I collected several reports and recommendations from consumer advocate organizations. Add to this already dazzling amount of information the need to make a decision on whether to purchase or lease, along with evaluating the dealers' special offers, such as cash-back incentives and low financing rates. In just a few days, I had so many facts, figures, and opinions that my head was spinning. To make matters worse, the results of all this effort were inconclusive.

In the end, I visited several car dealers and eventually bought the car I liked. Damn the data, I decided to go with what looked and felt like the right choice! After more than a year, I can honestly report that I am very happy with my selection.

This experience, no doubt, occurs thousands of times a month. Prospective car buyers make conscientious attempts at due diligence by investigating various makes, models, options, and reviews. Some people carefully assess the available information and make a quick, conscious choice based primarily on the data they have collected. But for many others, despite what the data reveal, they often end up delaying their decision and eventually buying the car that *pleases* them, the one that *feels right*. These buyers most likely base their decision on what some call a “gut reaction,” one that overrides—but doesn’t necessarily contradict—the data. They experience a deeper form of mental processing that involves unconscious thought and emotions.

But does this approach cause buyers to later regret their decision? Apparently not. Studies, like those carried out by psychologist Ap Dijksterhuis of Radboud University in the Netherlands, have shown that buyers who waited and mulled over the information for a while were more pleased with their eventual purchase than those who made a purchase immediately after reviewing the data.¹ This was true whether they purchased a car or a house. Likewise, Claude Messner and his colleagues at the University of Basel in Switzerland recently found that information overload decreased consumer satisfaction in their choices, and reducing the amount of information increased unconscious thought and choice satisfaction.²

The results of these studies seem counterintuitive. Surely, the more information we have, the better our decisions. Or not? Could this notion, which has been the mainstay of management courses for decades, be flawed? What’s going on here? To explain how unconscious thought and feelings can be so powerful and often make the right choice, we need to understand some basic facts about how our brains deal with incoming information.

The Brain Does Not Treat All Information the Same

The human brain evolved over many years through three basic stages (see fig. 1.1). The oldest part is the *brainstem*, sometimes called the *reptilian brain* because it resembles the entire brain of a reptile. This vital area controls and monitors functions necessary for our survival, such as breathing, body temperature, heartbeat, and digestion. Any

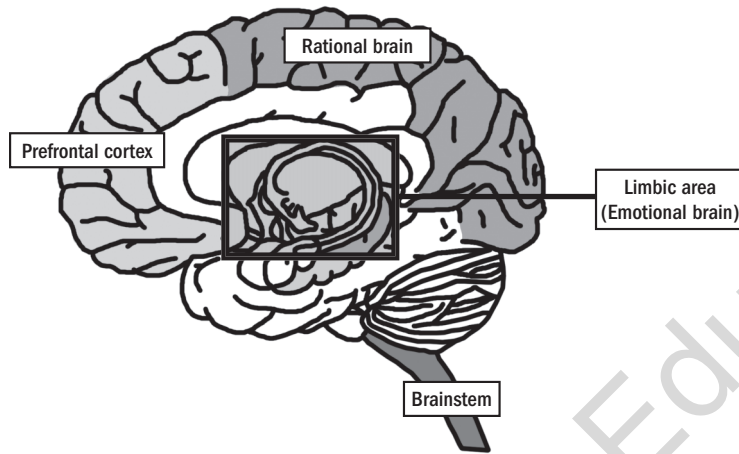


Figure 1.1: The three major parts of the brain and the prefrontal cortex.

incoming information that can affect our survival, such as a snarling dog or a burning odor, gets highest priority for processing. Survival information comes first.

Just above the brainstem is the next oldest area, known as the limbic system, responsible for processing emotional information and generating emotional responses. This area is often referred to as the *emotional brain*. Because emotions play an important role in maintaining family and community bonds, as well as in securing a mate, outside stimuli that contain emotional information have the next highest priority.

Finally, the last and largest area of the brain to develop (and thus the newest) is the *cortex*, or the *rational brain*. It makes up about 85 percent of the human brain's weight. Most reasoning occurs in the forward part of this region, called the *prefrontal cortex*, located just behind the forehead. The prefrontal cortex is responsible for solving problems, making decisions, and controlling emotions. Any incoming cognitive information not vital to survival or wrapped in strong emotion ends up here.

Whenever we respond emotionally to a situation, the limbic system plays a major role. Sometimes the emotional response is so intense that the more rational cognitive processes are suppressed or suspended. We have all experienced situations in which joy, anger, or fear of the unknown overcame our rational thoughts. Such a scene may result in us losing our ability to move ("I froze") or to speak ("I was dumbfounded"). Alternatively, it can lead us to do or say something that we regret later

on when our rational brain perks up and remarks, “I can’t believe you did that!” So how do the information-processing hierarchy and the touchy relationship between our rational and emotional brains explain why consumers who based their choice on feelings were more satisfied with their final selection than those who relied mainly on information? Did emotions take over and the rational brain toss all that information aside? Not exactly.

The Limited Capacity of Working Memory

Psychologists have known for a long time that our short-term memory (now called *working memory*), located in the prefrontal cortex, has a limited capacity. Back in the 1950s, George Miller from Princeton University’s psychology department suggested that the maximum number of items an individual could hold in working memory was seven, plus or minus two.³ (Perhaps that limit explains classic heptads, such as the seven deadly sins, seven seas, seven wonders of the world, and seven-digit telephone numbers.) However, recent research by Michael Kane (University of North Carolina, Greensboro), Randall Engle (Georgia Institute of Technology), and others suggests that this number is overstated and that our current capacity is closer to three to four items.⁴ Nonetheless, when working memory capacity is reached, something has to happen.

Get a pencil and a piece of paper. Stare at the number below for seven seconds, then look away and write it down. Ready? Go.

3521904

Compare the number you wrote down to the number above. Chances are high that you got it right. Now, let’s try that again, using another number and the same rules. Stare at the number below for seven seconds, look away, and write it down.

9237546302

Check what you wrote down. How did you do this time? Chances are you left out some digits. That’s because your brain treated each digit as a separate item, so your working memory got overloaded and simply ran out of capacity. This can also happen when you include too many variables when making an important business or personal decision. Items can slip out of working memory and not be considered as part of the decision at all. And this might be a good thing.

Dijksterhuis' studies found that when people were faced with purchasing decisions involving just a few variables, they took time to mull over the options before deciding and were satisfied with their choice.⁵ For those who made impulsive decisions, regret set in as they soon realized they didn't really want or like what they bought. The results changed considerably when the purchasing decision involved a large number of variables—for instance, buying furniture or a new car. Working memory could not focus on so much information and often chose to focus on just one variable, such as color or size. The end result was that the longer people analyzed their choices, the less satisfied they were with their purchasing decisions. Who were the most satisfied? Those who didn't spend much time thinking about all the information and just let their emotional brain make the selection.

Researchers in this area are not suggesting that the emotional brain entirely co-opts the decision-making process when working memory is overloaded. Rather, they suggest that just a few salient facts and feelings are processed over time below the level of consciousness—in unconscious thought—while the individual is engaged in unrelated conscious activities. Eventually, this unconscious process renders a decision that we recall and act on.

Exactly what happens in the brain during working memory overload has been the interest of researcher Angelika Dimoka at Temple University's Center for Neural Decision Making.⁶ She has studied the effects of too much information by working with bidders who are involved in a complex marketing frenzy called *combinatorial auctions*. These are bidding wars for numerous items that people can buy alone or bundled, such as landing slots at a busy metropolitan airport. The vast number of variables that the bidders need to consider eventually leads to information overload. Dimoka used a brain imaging technique known as *functional magnetic resonance imaging* (fMRI) to measure brain activity in the prefrontal cortex.

As the bidders received more and more information, Dimoka noticed that activity in the prefrontal cortex decreased quickly (see fig. 1.2, page 8). Working memory was getting full and rebelling. The bidders began to make dumb mistakes and bad choices because the prefrontal cortex essentially abandoned its role as the reasoned decision maker. Furthermore, without the prefrontal cortex exerting its control over the limbic system, emotions began to run rampant, causing a rise in

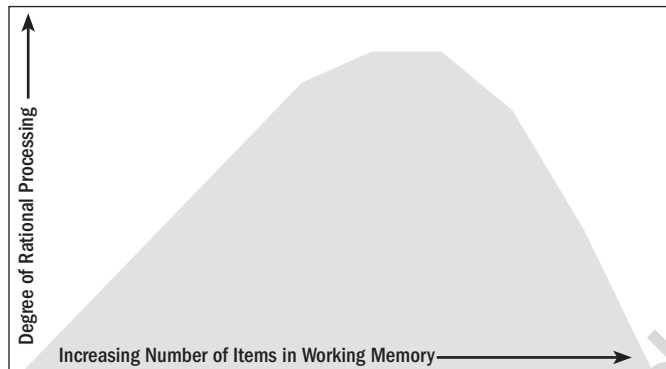


Figure 1.2: Rational processing increases as the number of items in working memory increases. However, after working memory capacity is reached, adding more items of information causes a sharp decline in rational processing, resulting in poor decisions.

the bidders' anxiety and frustration. This combined effect resulted in many bad decisions or no decision at all. Apparently, if a little knowledge is a dangerous thing, too much knowledge can be paralyzing.

One curious characteristic of working memory is the way it assigns importance to incoming information. In any learning situation, we tend to remember items presented at the beginning and the end much better than the items that came in the middle. The opening and closing of a presentation stay with us longer than the material in between. Researchers call this the *primacy-recency effect*. You probably experienced this effect earlier when you tried to remember that ten-digit number. Chances are high that you remembered the first several digits (9, 2, 3, 7) and last several (3, 0, 2) but had difficulty remembering those in the middle (5, 4, 6).

Figure 1.3 illustrates how the degree of remembering varies throughout a learning situation. At the beginning, working memory has the capacity to process new information, so it commands our attention (the first peak in the figure). However, as the number of new items approaches the capacity limit, anything else coming into working memory is likely to be lost or remembered only partially (the dip in the figure). As the presentation concludes, working memory sorts the information and once again pays attention, this time to the final items (the second peak).

Because of this effect, we are likely to give more importance to the most recent information we receive, while giving little weight to what