

CHAPTER 2

The Basis of Integrated Thinking on the Web

When you dive in for your morning swim, climb the stairs to wake your child, or walk to the corner store for a cold drink on a hot day, your body is responding to complex commands and impulses to get these tasks done. The human brain oversees these day-to-day activities; most of the time, we don't think about how complex the process is. A great example is driving—the process becomes rote. We don't think about it overtly, but the truth is, our brains perform complex biochemical and behavioral procedures involving learning, information processing, and memory to accomplish even the most seemingly mundane tasks.

Web designers and developers are challenged in a way that very few learners and thinkers are challenged. Not only is the complexity of the subjects that we study a concern, but the rate at which we must absorb that information and put it into practice seems unprecedented. We also have to manage the doing as well as the thinking: the hands-on creation of technology and design for web sites. All of these acts demand knowledge that is both broad and wide, and we must access that knowledge as quickly and as painlessly as going to the corner store for that cold beer.

As we seek to become more effective web designers and developers, our brains similarly must manage the complex process of learning, processing information, and rapidly storing that information into memory.

Information Processing and Human Learning

I'm of the mind-set that we can all become better at what we do by first giving ourselves credit for the interest in and fascination with a field whose very essence demands that its professionals think technologically and artistically. Then, to grow in our work, we must identify our strengths, be honest regarding our weaknesses, and push ourselves to find ways to improve our skills to achieve innovation.

Integration is necessary for the web designer and developer. This perspective arises out of the idea that most of our work is split between logic and creativity. That we must be logical and creative *at the same time* within any facet of our job reflects this split, and it is from this split that the idea of integration comes about.

But where did the idea of this split originate? A field of study known as *learning theory* focuses on this very issue. The specific theory of greatest interest to this discussion is referred to as *split brain* (see Figure 2.1). In split-brain theory, the pervasive belief is that the left and right hemispheres of the brain are each responsible for distinct types of information processing.

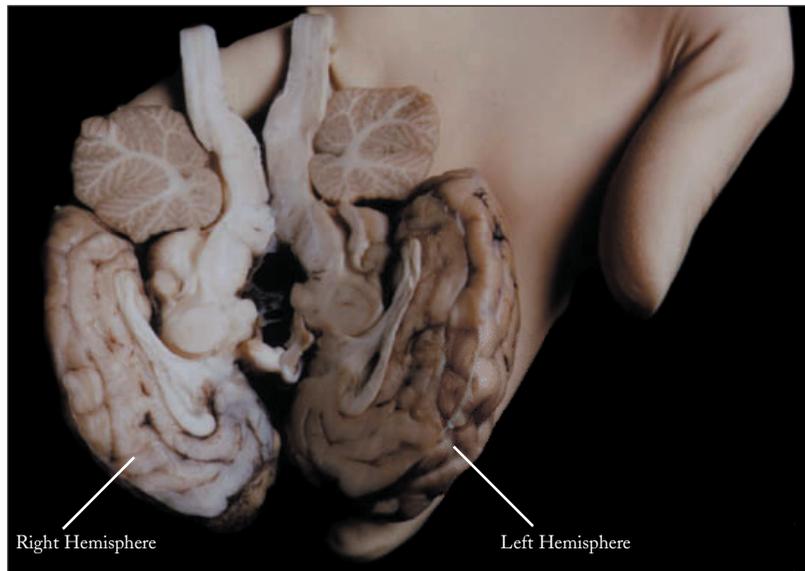


Figure 2.1 *Split brain theory suggests that the left and the right hemispheres of the brain are responsible for different kinds of information processing* (www.exploratorium.edu/memory/braindissection/index.html).

For more than 40 years, a psychobiologist named Roger Sperry studied the brain's physical functions. He found that the left side of the brain is typically more dominant, and is involved in reason and language. The right hemisphere has instead a nonverbal focus. According to this theory, it is responsible for such expressions as art, music, and other creative processes.

While split-brain theory is somewhat dated as a scientific concept, it is a very common metaphor that people use to describe themselves. Because of its common use, I use the metaphor here to help clarify the essence of the communication: That most people are not integrated in their thinking and as such require more information on how to achieve a more holistic viewpoint.

Perhaps the most intriguing part of split-brain theory is that, despite the theory's basis that certain activities are managed by independent sides of the brain, people ultimately rely on both sides—our mental processes somehow, somewhere integrate.

Most people do have specific strengths in the way they think. Some people are very adept at using their whole brain. Others have a more overt dominant hemisphere.

Roger Sperry received a Nobel Prize in 1981 for his studies, and his work is credited with having opened up new pathways of exploration in both psychology and biology.

“Unlike other aspects of cognitive function, emotions have never been readily confinable to one hemisphere... emotional effects tend to spread rapidly to involve both hemispheres.”

—Roger Sperry in his Nobel Lecture, 1981

Sperry points to the emotions as involving both hemispheres. It's possible to take Sperry's perspective and suggest that integration appears boldly at the emotional level. To create something new, to innovate, can be seen as some combination of left-brain logic and right-brain creativity. Add emotion, which is necessary to promote new ideas, and it's possible to suggest that mental integration is the precursor to innovation.

Of course, without the ability to express an idea in some articulate way, that idea cannot come to fruition. In order to go from integration to innovation to the *expression* of that innovation, we must have the skills and encouragement necessary to get there. True innovation involves a range of abilities, and communication becomes an essential factor when bringing ideas to light.

How to Achieve Innovation

The suggestion, then, is that if we as web designers and developers want to be innovative in our work, we must understand our areas of strength and our areas of weakness. So just how do we do this? Study Table 2.1, and write down which features you feel are your strongest. Then provide yourself with a sentence or two explaining why you believe this to be true.

Table 2.1 Left- and Right-Brain Features

Left Brain	Right Brain
Logical	Intuitive
Sequential	Random
Rational	Holistic
Analyzes	Synthesizes
Objective	Subjective
Parts	Wholes

This is what I came up with:

- **Logical.** Do you favor logic over intuition? Logic is my default mode. If I can't deal with something random or chaotic, I use logic as a means to work through it.
- **Rational.** Are you a rationalist or do you think holistically? Although I'm not at first glance always a rational person, I am a realist, which suggests to me that I process information in a rational way.
- **Analytical.** Do you analyze or synthesize? I have a friend who once said, "Hand Molly a plain white piece of paper, and you'll have an analysis back in less than five minutes."
- **Intuitive.** If you are intuitive, can you also be logical? Perhaps it is my gender—or just my personality—but I am very aware of my intuition and have found that when I don't listen to it, I end up hurt.
- **Holistic.** Do you find that your thinking tends to be very open minded, or more concerned with empiric evidence? Big-picture thinking suits me. I'm passionate but not always very precise. And, while I am interested in the empiric, I have never had a need to have proof of something in order to agree with its possibilities.
- **Wholes.** Do you see things in their distinct parts, or do you see whole groups? First, I see the composition, the whole. Then I see what it's made up of. I think in terms of wholes rather than parts.

Explore your personal results, and take some time to consider what they mean. This is an important exercise, because it will help you gain a better sense of how you learn, solve problems, and ultimately, how you will be best able to strengthen any weaknesses and feel confident about your strengths.

Human Memory as a Metaphor for the Web

It's interesting to consider that half of my strengths come from the left brain, whereas the other half come from the right brain. Like many readers of this book, I am already integrated to some degree. But there are areas in which I am definitely weaker on both sides, and these are the areas that need attention.

Early education, at least in most high-tech societies, tends to favor left-brain modes of thinking while down-playing right-brain modes. This could be at the core of some of our real challenges: We've been educated and enculturated to think in specific ways—even if those ways are not natural to our own, unique patterns.

While how we think individually makes an enormous impact on how well equipped we are to be innovative as web designers and developers, how our brains work physiologically also has impact on how we work with and grow the web.

The comparison of the human brain to computers is not only commonplace, but it also has gained broad acceptance in psychological, philosophical, and computer science communities. Some very general comparisons include those listed in Table 2.2.

Table 2.2 Brain and Computer

Brain	Computer
Nerve cells	CPU
Long-term memory	Hard drive
Short-term memory	RAM

The web can be seen as comparable to the pathways of human memory. The best way to quickly understand this concept is through analogy.

My father died some 13 years ago. Let's say that someone in my family brings up his name. His name can act as the spark that starts my memory working. An image of my father comes to the forefront of my mind.

But the information that makes up my father's image is not stored all in one file or even in one specific part of my brain. It is, in fact, broken up into minute pieces of memory data and is strewn far and wide in various neural pockets, just as various bits of information on a web site are located in different files or directories. To put together the image of my dad, my brain has to collect all the bits of data—eyes, nose, mouth, ears, body—by rapidly traveling on a variety of neural pathways and ultimately putting them together in one cohesive piece. If these processes work, I end up with the image of my father.

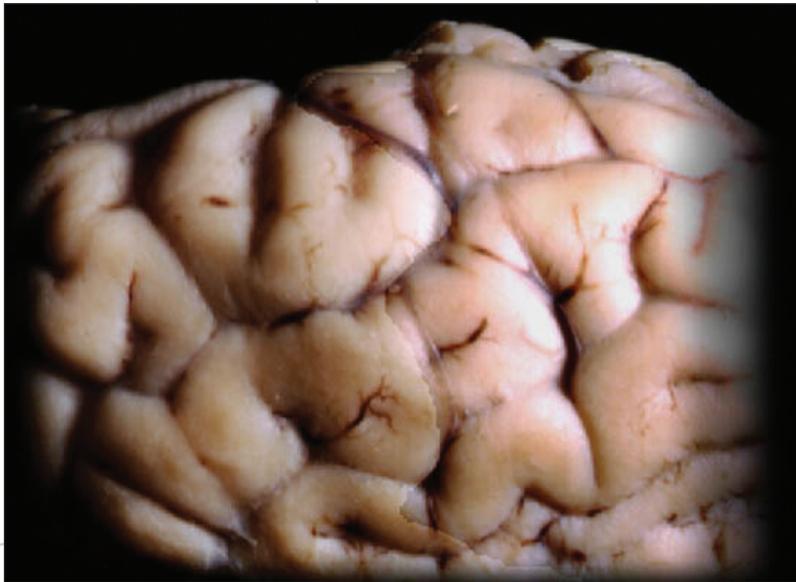


Figure 2.2 Mid-section of the brain (www.exploratorium.edu/memory/braindissection/index.html).

Memory, like the web, can be argued as being nonlinear. Yet typically, most westerners have learned to read left to right, we conceive time as being linear, and we usually receive information passively from a single source such as a parent, a teacher, or the TV. We also tend to process information in a linear fashion—but *only* because we've learned to do it that way.

Memory can be thought of as a nonlinear process (see Figure 2.3), comparable to the way we perceive the data retrieval and circuitry of a web site. One piece fits into the next piece and so on, but they refer back to one another, connect over others as unrelated masses of information, and run in tangents, spirals, and spheres. It is the way in which we perceive this process that creates an opportunity for endless, creative discovery in educational and human growth potential.

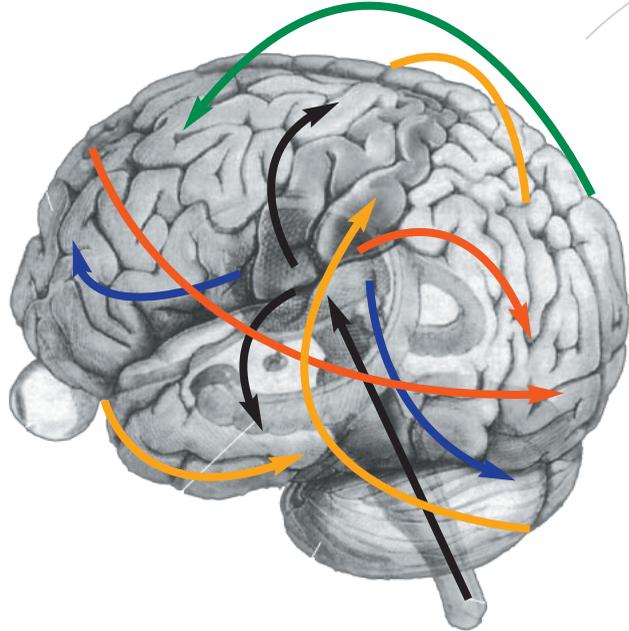


Figure 2.3 Pathways of data traveling the brain
(www.exploratorium.edu/memory/braindissection/index.html).

The experience of surfing the web is not generally a linear one (see Figure 2.4). We move through it tangentially. Our path along the way has spirals and spheres, but only sometimes do we navigate in straight lines. For these reasons, the web stands to be a potent element in the future of human development as it pertains to information absorption and processing.

The business of creating web sites challenges us to think differently than how we were taught to think. We are instead encouraged to think in the way that the facets of memory and emotion naturally exist and are expressed—complete with non sequiturs and sidebar discussions. The web is a buzz for so many people because it satisfies a very deep need to combine cerebral processes: left brain/right brain, the linear with the nonlinear, the conceptual with the concrete.

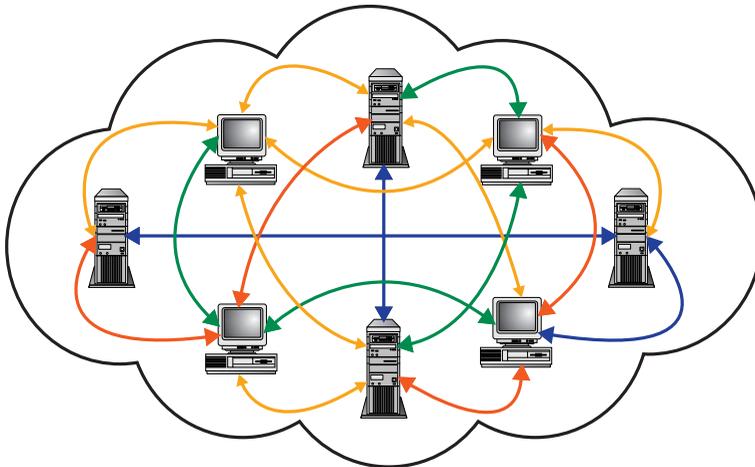


Figure 2.4 Pathways of data on the World Wide Web.

As web designers and developers, we can take the integrated potential of the web and, if we've been successful at integrating our own skills, tap into that potential as a source of inspiration. We can only benefit from understanding these interesting concepts and theories. Not only do these ideas aid us in deciding how and when to use specific approaches to a site's design, but these concepts also enable us to think about the user and his experience with the site.

Moreover, with this type of knowledge, web designers essentially plant seeds in fertile ground for high-quality communications. Even in the case of a commercial site, the opportunity for education, humor, and personal advancement exists. This is the web at its finest—a fun, informative, effective tool that has the opportunity to stimulate the mind instead of numbing it, as media which encourage passivity so often have done.

Where Integration Begins

When working on a web site, we embark on the integration of language and science, art and technology, and concept and practice the moment we create a link (hypertext) on a web page. Instead of just reading the page, our site visitors are now motivated to make a decision whether to follow that link or not. Links move us away from a static media element that encourages passivity to one that encourages activity.

Using Personal Growth to Effect Change on the Web

My stepfather is a scientist, and he pointed out to me in a conversation that evolution can be used as a terrific metaphor for the growth of the web. In the early phases of evolution, features appear and then disappear, often very quickly. At some point, the process stabilizes and the organism has a period in which some basic, shared features dominate.

But the evolutionary process is typically long. Ecosystems, for example, are old. In contrast, the web is in ridiculously nascent form. But some basic, shared features already exist in the evolution of language and science on the web.

As these shared features become more stable, we have more opportunity to determine how to help them along in their evolutionary growth. This can be clearly seen in the move toward structured markup and the use of CSS. After years of attempting to force HTML to accommodate presentational needs, we've finally realized a better approach. We could continue to try and make HTML work, but that would limit evolution.

So, we've revised our methods in accordance with the limitations we discovered. This is exactly how our own personal growth influences our work. The challenge of finding a means to visually design the web without disturbing its communicative abilities forced us to reevaluate our technical direction. This is innovation, which has in turn helped to stabilize the web's infrastructure enough so as to provide opportunities for new features to emerge. The proliferation of alternative devices and wireless access to the web exemplifies this perfectly.

Articulating the Conceptual

The interactivity that is first defined in a link and taken to new heights with imagery is exciting because its content is driven only in part by the designer. It then must be navigated by site visitors, each of whom might choose to go about the task independently. This creates an active rather than passive relationship between the user and the content. Site visitors chart their own courses through the highways and byways of a site and the other sites that it links to, depending upon the way the links appeal to them. The discovery process within this journey is the essence of new media and exemplifies nonlinear thinking. It also opens the doorways to new and exciting creations.

One of the essential elements of the web is the capability to use interactivity as a means to precisely communicate multiple thoughts, ideas, and data. A site might contain access to such documents, but within the definition of new media, content presentation demands concise expression.

In a textbook, we are allowed the liberty to explore complicated ideas within hundreds or thousands of pages. This type of exploration simply cannot occur the same way on the web, mostly due to the nature of the onscreen environment. In some instances, such as when people use commercial services for access, time online costs money, and that is a consideration as well. Web visitors often want to have their ideas delivered in a snappy, quick, and concise fashion. Many information architects and usability

Evolution, Darwin, and Innovation

These excerpts from the writing of Charles Darwin discuss evolution in a poetic, naturalistic framework. Yet the writing is scientific by influence, providing us with an excellent example of integrated thought resulting in innovation.

"The affinities of all the beings of the same class have sometimes been represented by a great tree. I believe this simile largely speaks the truth. The green and budding twigs may represent existing species; and those produced during each former year may represent the long succession of extinct species..."

"The limbs divided into great branches, and these into lesser and lesser branches, were themselves once, when the tree was small, budding twigs; and this connection of the former and present buds by ramifying branches may well represent the classification of all extinct and living species in groups subordinate to groups..."

"From the first growth of the tree, many a limb and branch has decayed and dropped off, and these lost branches of various sizes may represent those whole orders, families, and genera which have now no living representatives, and which are known to us only from having been found in a fossil state..."

"As buds give rise by growth to fresh buds, and these, if vigorous, branch out and overtop on all a feeble branch, so by generation I believe it has been with the Tree of Life, which fills with its dead and broken branches the crust of the earth, and covers the surface with its ever branching and beautiful ramifications."

engineers suggest that ideas must be clear, written much more like headlines than detailed paragraphs. The concept is to catch the reader's eye, quickly get to the point of the site, and then offer greater details as necessary.

Interactivity can help or hinder this process, depending upon how it is used. If a hyperlink to another document is placed in the first sentence of a web site introduction, there is a chance of losing a visitor within the first several seconds of his visit. At the other extreme, if no hypermedia is used within a web document, the strengths of the web are not being exploited. It takes a strong mix of writing skills and good instinct to combine hypermedia with short, sharp language to get right to, rather than away from, the point of a site.

Ultimately, how we articulate interactivity is critical to understanding both the structure of the web and our own methods of learning, information gathering, and memory processing. In fact, the web can be seen as mimicking human memory. By understanding this, we become more intimately familiar with the structure of the web as well as our own learning processes. Take that to the next level, and you end up with the compelling idea that how we learn, integrate that learning, and express that integration is the foundation upon which truly innovative designs are built.

Integrated Design

When we compare our personal makeup and general physiology to the structure of the web, we are able to make specific, empowering connections.

Consider:

- Most education in high-tech countries tends to group us by intellectual strength rather than helping us to strengthen our less active aspects.
- How well we can integrate ideas as web designers and developers depends upon being able to strengthen our weaker aspects.
- We can use a nonlinear model of human learning and memory and compare it to the nonlinear aspects of the web, allowing us to view the web in an emotional as well as physical way.

A conclusion can be drawn, then, that the integration of our perceptions of the web with our perceptions about ourselves affords opportunities for innovation and evolution both for ourselves and for the web.