TV shows, but owning a
word through sound and
ult of all this new capabil-
mer” is now a temporary

CHAPTER 5
PERSONAL MOTIVATION MEETS
COLLABORATIVE PRODUCTION

Collaborative production, where people have to coordinate
with one another to get anything done, is considerably
harder than simple sharing, but the results can be more
profound. New tools allow large groups to collaborate, by
taking advantage of nonfinancial motivations and by al-
lowing for wildly differing levels of contribution.

Perhaps the most famous example of distributed collabora-
tion today is Wikipedia, the collaboratively created encyclo-
dedia that has become one of the most visited websites in
in 2001 as an experimental offshoot of their original idea, a
free online encyclopedia of high quality called Nupedia.
Nupedia was to be written, reviewed, and managed by experts
volunteering their time. Wales had had a taste of collabora-
tively produced work while running Bomis, an internet com-
pany he’d helped found in 1996. Bomis was in the business
of helping (mainly male) users create and show collections of related websites on subjects like overengineered cars and underdressed starlets; it was like a user-curated Maxim. He had seen how quickly and cheaply the users could share information with one another, and he thought that sort of collaborative creation could be applied to other domains. He sketched out the idea for Nupedia, secured investment from Bomis in early 2000, and hired Sanger, a Ph.D. candidate in philosophy who shared Wales's interest in theories of knowledge, as employee number one.

Sanger began designing a process for creating Nupedia articles, and after several weeks of preparation, he and Wales announced the project with a stirring question:

Suppose scholars the world over were to learn of a serious online encyclopedia effort in which the results were not proprietary to the encyclopedists, but were freely distributable... in virtually any desired medium. How quickly would the encyclopedia grow?

Not very quickly, as it turned out. Nine months after that announcement, Wales and Sanger's big idea wasn't working; if scholars the world over had learned of Nupedia, they certainly hadn't responded by rushing in to help. In the months after the original announcement, most of the effort had been spent on recruiting a volunteer advisory board and on establishing editorial policy guidelines and a process for the creation, review, revision, and publication of articles. This process, intended to set a minimum standard of quality, had also set a
users create and show collections of s like overengineered cars and unlike a user-curated Maxim. He hadply the users could share informa-
tion thought that sort of collaborative o other domains. He sketched out ed investment from Bomis in early Ph.D. candidate in philosophy who

theory of knowledge, as employee
g a process for creating Nupedia

weeks of preparation, he and Wales

a stirring question:

world over were to learn of a

pedia effort in which the re-
tary to the encyclopedists, but

... in virtually any desired ky would the encyclo-

turned out. Nine months after that

Sanger's big idea wasn't working: nd learned of Nupedia, they cer-

ushing in to help. In the months

ment, most of the effort had been
teer advisory board and on estab-

elines and a process for the cre-

ublication of articles. This process,

standard of quality, had also set a

maximum rate of progress: slow. At the end of that gestation

period there were fewer than twenty finished articles and an-

other few in various stages of work. (One can't call them stages of

completion, since completion was something Nupedia was

visibly bad at.)

For those scholars who were successfully recruited to par-
ticipate, the flow of work from a draft article to something

published involved seven separate steps. If an article was

stopped at any of those steps—for review, fact-checking, spell-

checking, whatever—it could remain stopped indefinitely.

Increasingly frustrated with the slow pace, and aware that

their own process had erected many new barriers to replace

the ones the Web had removed, Sanger suggested a new stra-

gy to Wales: use a tool called a wiki to create the first draft of

Nupedia articles.

The first wiki was created by Ward Cunningham, a software

engineer, in 1995. (The name wiki is taken from the Hawaiian

word for "quick.") Cunningham wanted a way for the software

community to create a repository of shared design wisdom. He

observed that most of the available tools for collaboration were

concerned with complex collections of roles and require-

ments—only designated writers could create text, whereas only

editors could publish it, but not until proofreaders had ap-

proved it, and so on. Cunningham made a different, and rad-

cal, assumption: groups of people who want to collaborate also
tend to trust one another. If this was true, then a small group
could work on a shared writing effort without needing formal

management or process.

Cunningham's wiki, the model for all subsequent wikis, is

a user-editable website. Every page on a wiki has a button
somewhere, usually reading “Edit this,” that lets the reader add, alter, or delete the contents of the page. With a book or a magazine the distinction between reader and writer is enforced by the medium; with a wiki someone can cross back and forth between the two roles at will. (Flexibility of role is a common result of mass amateurization.) Whenever a user edits anything on a given webpage, the wiki records the change and saves the previous version. Every wiki page is thus the sum total of accumulated changes, with all earlier edits stored as historical documentation. This was a gamble, but Cunningham’s design worked beautifully; the first wiki, called the Portland Pattern Repository, became an invaluable collection of software engineering wisdom without requiring either formal oversight or editorial controls. By placing the process in the hands of the users rather than embedding it in the tool, the wiki dispensed with the slowness that often comes with highly structured work environments. Seeing this effect, other groups began to adopt wikis.

In early 2001 a friend of Sanger’s told him about wikis, and he in turn introduced the idea to Wales. They set up a test wiki on Nupedia as a way to create rough drafts, which had two immediate effects. First, it became much easier to create initial versions of articles. The second effect, which they had not anticipated, was swift and vehement objection from their own advisory board. The board had been recruited to oversee a rigorous process, designed and run by experts, and the wiki offended their sense of the mission. A few days after they’d launched it, Wales and Sanger had to move the nascent wiki off the Nupedia site to placate the board. As the wiki now needed its own URL, they chose Wikipedia.com, and Wikipedia was born.
Once Wikipedia was up, Sanger posted a note to the Nupedia mailing list, which by that point had about two thousand members, saying, "Humor me. Go there and add a little article. It will take all of five or ten minutes." The change was immediate and dramatic; Wikipedia surpassed Nupedia in total number of articles in its first few weeks of existence. By the end of the year, with fifteen thousand articles in place and the rate of growth continuing to increase, two things became clear: Wikipedia was viable, and Nupedia was not.

Seeing this success, Sanger shifted to the Wikipedia effort, dropping his Nupedia "editor in chief" title along the way and instead calling himself "Chief Organizer." Despite the mollifying nature of this title, he managed to infuriate the other participants when he said, in a message to the Wikipedia mailing list, "I do reserve the right to permanently delete things—particularly when they have little merit and when they are posted by people whose main motive is evidently to undermine my authority and therefore, as far as I'm concerned, damage the project." Sanger's assumption of special rights over the project, and his equation of those prerogatives with the project's success, only worsened the friction about his role.

In part because of these clashes, and in part because Wikipedia's growth neither created nor required revenue, Sanger was laid off at the end of 2001. The Wikipedia project was later transferred to Wikipedia.org to cement its nonprofit status; the progression from Nupedia to Wikipedia as we know it today was complete. Continued growth was uninterrupted by Sanger's departure; Wikipedia has continued to grow steadily in both articles and users. The English-language version crossed the two-million-article mark in September...
2007, and the English-language Wikipedia is the eleventh most popular site in the United States; all of the top ten are commercial operations.

Wikipedia's Content

Mere volume would be useless if Wikipedia articles weren't any good, however. By way of example, the article on Pluto as of May 2007 begins:

Pluto, also designated 134340 Pluto, is the second-largest known dwarf planet in the Solar System and the tenth-largest body observed directly orbiting the Sun. Originally considered a planet, Pluto has since been recognized as the largest member of a distinct region called the Kuiper belt. Like other members of the belt, it is primarily composed of rock and ice and is relatively small; approximately a fifth the mass of the Earth's Moon and a third its volume. It has an eccentric orbit that takes it from 29 to 49 AU from the Sun, and is highly inclined with respect to the planets. As a result, Pluto occasionally comes closer to the Sun than the planet Neptune.

That paragraph includes ten links to other Wikipedia articles on the solar system, astronomical units (AU), and so on. The article goes on for five thousand words and ends with an extensive list of links to other sites with information about Pluto. This kind of thing—a quick overview, followed by broad
and sometimes quite lengthy descriptions, ending with pointers to more information—is pretty much what you'd want in an encyclopedia.

The Pluto article is not unusual; you can find articles of similarly high quality all over the site.

The Okeechobee Hurricane, or Hurricane San Felipe Segundo, was a deadly hurricane that struck the Leeward Islands, Puerto Rico, the Bahamas, and Florida in September of the 1928 Atlantic hurricane season. It was the first recorded hurricane to reach Category 5 status on the Saffir-Simpson Hurricane Scale in the Atlantic basin.

Ludwig Josef Johann Wittgenstein (April 26, 1889 in Vienna, Austria—April 29, 1951 in Cambridge, England) was an Austrian philosopher who contributed several ground-breaking ideas to philosophy, primarily in the foundations of logic, the philosophy of mathematics, the philosophy of language, and the philosophy of mind. His influence has been wide-ranging, placing him among the most significant philosophers of the 20th century.

And so on. There are hundreds of thousands of articles whose value is both relied on and improved daily.

The most common criticism of Wikipedia over the years stemmed from simple disbelief: “That can’t work.” Sanger understood this objection and titled an early essay on the growth of Wikipedia “Wikipedia is wide open. Why is it growing so
fast? Why isn’t it full of nonsense?” In that article he ascribed at least part of the answer to group editing:

Wikipedia’s self-correction process (Wikipedia co-founder Jimmy Wales calls it “self-healing”) is very robust. There is considerable value created by the public review process that is continually ongoing on Wikipedia—value that is very easy to underestimate, for those who have not experienced it adequately.

One other fateful choice, which actually predates the founding of Wikipedia itself, was the name, or rather the “-pedia” suffix. Wikipedia, like all social tools, is the way it is in part because of the way the software works and in part because of the way the community works. Though wikis can be used for many kinds of writing, the early users were guided by the rhetorical models of existing encyclopedias, which helped synchronize the early work: there was a shared awareness of the kind of writing that should go into a project called Wikipedia. This helped coordinate the users in ways that were not part of the software but were part of the community that used the software.

Wikipedia has now transcended the traditional functions of an encyclopedia. Within minutes of the bombs going off in the London transit system, someone created a Wikipedia page called “7 July 2005 London bombings.” The article’s first incarnation was five sentences long and attributed the explosions to a power surge in the Underground, one of the early theories floated before the bus bombing was linked to the Underground explosions. The Wikipedia page received more than a thousand edits in its first four hours of existence, as additional news
at article he ascribed (g:

Wikipedia co-
aling") is very
created by the
ly ongoing on
nderestimate,
adquately.

predates the found-
ther the "-pedia"
way it is in part be-
part because of the
n be used for many
ed synchronize the
the kind of writing
ia. This helped co-
of the software but
ftware.
nitional functions of
be going off in the
a Wikipedia page
icle's first incar-
 the explosions to
 the early theories
the Underground
 e than a thousand
 additional news

came in; users added numerous pointers to traditional news
sources (more symbiosis) and a list of contact numbers for
people either trying to track loved ones or simply figuring out
how to get home. What was conceived as an open encyclopedia
in 2001 has become a general-purpose tool for gathering and
distributing information quickly, a use that further cemented
Wikipedia in people's mind as a useful reference work. Note
the virtuous circle at work here: because enough people thought
of using Wikipedia as a coordinating resource, it became one,
and because it became one, more people learned to think of it
as a coordinating resource. This evolution was made possible
precisely because the community had gotten the narrower ver-
sion of an encyclopedia right earlier, which provided a high-
visibility platform for further experimentation.

Skepticism about Wikipedia's basic viability made some
sense back in 2001; there was no way to predict, even with the
first rush of articles, that the rate of creation and the average
quality would both remain high, but today those objections
have taken on the flavor of the apocryphal farmer beholding
his first giraffe and exclaiming, "Ain't no such animal!"
Wikipedia's utility for millions of users has been settled; the
interesting questions are elsewhere.

Unmanaged Division of Labor

It's easy to understand how Cunningham's original wiki func-
tioned; a small group that knows one another presents organ-
izational challenges no worse than getting a neighborhood
poker game going. But Wikipedia doesn't operate at the scale
of a neighborhood poker game; it operates at the scale of a Vegas casino. Something this big seems like it should require managers, a budget, a formal work-flow process. Without those things how could it possibly work? The simple but surprising answer is: spontaneous division of labor. Division of labor is usually associated with highly managed settings, but it's implemented here in a far more unmanaged way. Wikipedia is able to aggregate individual and often tiny contributions, hundreds of millions of them annually, made by millions of contributors, all performing different functions.

Here's how it works. Someone decides that an article on, say, asphalt should exist and creates it. The article's creator doesn't need to know everything (or indeed much of anything) about asphalt. As a result, such articles often have a "well, duh" quality to them. The original asphalt article read, in full, "Asphalt is a material used for road coverings." The article was created in March 2001, at the dawn of Wikipedia, by a user named Cdani, as little more than a placeholder saying, "We should have an article on asphalt here." (Wikipedians call this a "stub."

Once an article exists, it starts to get readers. Soon a self-selecting group of those readers decide to become contributors. Some of them add new text, some edit the existing article, some add references to other articles or external sources, and some fix typos and grammatical errors. None of these people needs to know everything about asphalt; all contributions can be incremental. And not all edits are improvements: added material can clutter a sentence, intended corrections can unintentionally introduce new errors, and so on. But every edit is itself provisional. This works to Wikipedia's benefit partly because bad changes can be rooted
rates at the scale of a s like it should require low process. Without c? The simple but sur-
a of labor. Division of nanaged settings, but maged way. Wikipedia in tiny contributions, made by millions of nctions.
ges that an article on,
The article's creator m (much of anything) ten have a "well, duh" read, in full, "Asphalt e article was created ia, by a user named ing, "We should have all this a "stub."
readers. Soon a self-o become contribu- e edit the existing articles or external errors. None of ut asphalt; all con-edits are improve-
tence, intended e new errors, and al. This works to ages can be rooted out faster, but also partly because human knowledge is pro-
visional. During 2006 a debate broke out among astrono-
mers on whether to consider Pluto a planet or to relegate it to another category; as the debate went on, Wikipedia's Pluto page was updated to reflect the controversy, and once Pluto was demoted to the status of "dwarf planet," the Pluto entry was updated to reflect that almost immediately.

A Wikipedia article is a process, not a product, and as a re-
sult, it is never finished. For a Wikipedia article to improve, the good edits simply have to outweigh the bad ones. Rather than filtering contributions before they appear in public (the process that helped kill Nupedia), Wikipedia assumes that new errors will be introduced less frequently than existing ones will be corrected. This assumption has proven correct; despite occasional vandalism, Wikipedia articles get better, on average, over time.

It's easy to understand division of labor in industrial set-
tings. A car comes into being as it passes down an assembly from one group of specialists to the next—first the axle, then the wheels. A wiki's division of labor is nothing like that. As of this writing, the asphalt article has had 129 different contributors, who have subdivided it into two separate articles, one on asphalt, the petroleum derivative, and another on asphalt concrete, the road covering. To each of these articles, the contributors have added or edited sections on the chemistry, history, and geographic distribution of asphalt deposits, on different types of asphalt road surfaces, and even on the etymology of the word "asphalt," transforming the original seven-word entry into a pair of detailed and informative articles. No one person was responsible for doing or even managing the work, and yet researching, writing, editing, and proofreading have all
unfolded over the course of five years. This pattern also exists across Wikipedia as a whole: one person can write new text on asphalt, fix misspellings in Pluto, and add external references for Wittgenstein in a single day. This system also allows great variability of effort—of the 129 contributors on the subject of asphalt, a hundred of them contributed only one edit each, while the half-dozen most active editors contributed nearly fifty edits among them, almost a quarter of the total. The most active contributor on the subject of asphalt, a user going by SCEhardt, is ten times more active than the average contributor and over a hundred times more active than the least active contributor.

This situation is almost comically chaotic—a car company would go out of business in weeks if it let its workers simply work on what they wanted to, when they wanted to. A car company has two jobs. The obvious one is making cars, but the other job is being a company. It's hard work to be a company; it requires a great deal of effort and a great deal of predictability. The inability to count on an employee's particular area of expertise, or even on their steady presence, would doom such an enterprise from the start. There is simply no commercially viable way to let employees work on what interests them as the mood strikes. There is, however, a noncommercial way to do so, which involves being effective without worrying about being efficient.

Wikis avoid the institutional dilemma. Because contributors aren't employees, a wiki can take a staggering amount of input with a minimum of overhead. This is key to its success: it does not need to make sure its contributors are competent, or producing steadily, or even showing up. Mandated specialization
of talent and consistency of effort, seemingly the hallmarks of large-scale work, actually have little to do with division of labor itself. A business needs employee A and employee B to put in the same effort if they are doing the same job, because it needs interchangeability and because it needs to reduce friction between energetic and lazy workers. By this measure, most contributors to Wikipedia are lazy. The majority of contributors edit only one article, once, while the majority of the effort comes from a much smaller and more active group. (The two asphalt articles, with a quarter of the work coming from six contributors, are a microcosm of this general phenomenon.) Since no one is being paid, the energetic and occasional contributors happily coexist in the same ecosystem.

The freedom of contributors to jump from article to article and from task to task makes the work on any given article unpredictable, but since there are no shareholders or managers or even customers, predictability of that sort doesn’t matter. Furthermore, since anyone can act, the ability of the people in charge to kill initiatives through inaction is destroyed. This is what befell Nupedia; because everyone working on that project understood that only experts were to write articles, no one would even begin an article they knew little about, and as long as the experts did nothing (which, on Nupedia, is mostly what they did), nothing happened. In an expert-driven system, an article on asphalt that read “Asphalt is a material used for road coverings” would never appear, even as a stub. So short! So uninformative! Why, anyone could have written that! Which, of course, is one of the principal advantages of Wikipedia.

In a system where anyone is free to get something started, however badly, a short, uninformative article can be the anchor...
for the good article that will eventually appear. Its very inadequacy motivates people to improve it; many more people are willing to make a bad article better than are willing to start a good article from scratch. In 1991 Richard Gabriel, a software engineer at Sun Microsystems, wrote an essay that included a section called "Worse Is Better," describing this effect. He contrasted two programming languages, one elegant but complex versus another that was awkward but simple. The belief at the time was that the elegant solution would eventually triumph; Gabriel instead predicted, correctly, that the language that was simpler would spread faster, and as a result, more people would come to care about improving the simple language than improving the complex one. The early successes of a simple model created exactly the incentives (attention, the desire to see your work spread) needed to create serious improvements. These kinds of incentives help ensure that, despite the day-to-day chaos, a predictable pattern emerges over time: readers continue to read, some of them become contributors, Wikipedia continues to grow, and articles continue to improve. The process is more like creating a coral reef, the sum of millions of individual actions, than creating a car. And the key to creating those individual actions is to hand as much freedom as possible to the average user.

A Predictable Imbalance

Anything that increases our ability to share, coordinate, or act increases our freedom to pursue our goals in congress with one another. Never have so many people been so free to say
and do so many things with so many other people. The freedom driving mass amateurization removes the technological obstacles to participation. Given that everyone now has the tools to contribute equally, you might expect a huge increase in equality of participation. You'd be wrong.

You may have noticed a great imbalance of participation in many examples in this book. The Wikipedia articles for asphalt had 129 contributors making 205 total edits, but the bulk of the work was contributed by a small fraction of participants, and just six accounted for about a quarter of the edits. A similar pattern appears on Flickr: 118 photographers contributed over three thousand Mermaid Parade photos to Flickr, but the top tenth contributed half of those, and the most active photographer, Czarina, contributed 238 photos (about one in twelve) working alone. This shape, called a power law distribution, is shown in Figure 5-1.

![Figure 5-1: The distribution of photographers contributing photos of the 2005 Coney Island Mermaid Parade.](image)

...coordinate, or act in congress with...
Five points are shown on this graph. The two leftmost data points are the most and second-most active photographers. The most active photographer is far more active than the second most active, and they are both far more active than most of the rest of the photographers. The average number of photos taken (all photos divided among all photographers) is twenty-six, while the median (the middle photographer) took eleven photos, and the mode (the number of photos that appeared most frequently) is a single photo.

Note the sharp drop-off in the number of photos between the top few contributors and most of the participants. Notice too that because of the disproportionate contributions of these few photographers, three-quarters of the photographers contributed a below-average number of pictures. This pattern is general to social media: on mailing lists with more than a couple dozen participants, the most active writer is generally much more active than the person in the number-two slot, and far more active than average. The longest conversation goes on much longer than the second-longest one, and much longer than average, and so on. Bloggers, Wikipedia contributors, photographers, people conversing on mailing lists, and social participation in many other large-scale systems all exhibit a similar pattern.

There are two big surprises here. The first is that the imbalance is the same shape across a huge number of different kinds of behaviors. A graph of the distribution of photo labels (or "tags") on Flickr is the same shape as the graph of readers-per-weblog and contributions-per-user to Wikipedia. The general form of a power law distribution appears in social settings when some set of items—users, pictures, tags—is ranked by frequency of
is graph. The two leftmost
second-most active photogra-
her is far more active than
re both far more active than
ers. The average number
ong all photographers) is
middle photographer) took
number of photos that
time.

time. Notice
of contributions of these
of the photographers con-
f pictures. This pattern is
lists with more than a
active writer is generally
in the number-two slot,
The longest conversation
d-longest one, and much
gers, Wikipedia contribu-
ing on mailing lists, and
urge-scale systems all ex-

The first is that the imbal-
number of different kinds
of photo labels (or "tags")
ph of readers-per-weblog
lia. The general form of
social settings when some
ranked by frequency of
occurrence. You can rank a group of Flickr users by the number
of pictures they submit. You can rank a collection of pictures
by the number of viewers. You can rank tags by the number of
pictures they are applied to. All of these graphs will be in the
rough shape of a power law distribution.

The second surprise is that the imbalance drives large social
systems rather than damaging them. Fewer than two percent
of Wikipedia users ever contribute, yet that is enough to create
profound value for millions of users. And among those con-
tributors, no effort is made to even out their contributions. The
spontaneous division of labor driving Wikipedia wouldn't be
possible if there were concern for reducing inequality. On the
contrary, most large social experiments are engines for har-
nessing inequality rather than limiting it. Though the word
"ecosystem" is overused as a way to make simple situations
seem more complex, it is merited here, because large social
systems cannot be understood as a simple aggregation of the
behavior of some nonexistent "average" user.

The most salient characteristic of a power law is that the
imbalance becomes more extreme the higher the ranking. The
operative math is simple—a power law describes data in which
the nth position has 1/nth of the first position's rank. In a pure
power law distribution, the gap between the first and second
position is larger than the gap between second and third, and
so on. In Wikipedia article edits, for example, you would expect
the second most active user to have committed only half as
many edits as the most active user, and the tenth most active
to have committed one-tenth as many. This is the shape behind
the so-called 80/20 rule, where, for example, 20 percent of a
store's inventory accounts for 80 percent of its revenues, and
it has been part of social science literature since Vilfredo Pareto, an Italian economist working in the early 1900s, found a power law distribution of wealth in every country he studied; the pattern was so common that he called it "a predictable imbalance." This is also the shape behind Chris Anderson's discussion in The Long Tail; most items offered at online retailers like iTunes and Amazon don't sell well, but in aggregate they generate considerable income. The pattern doesn't apply just to goods, though, but to social interactions as well. Real-world distributions are only an approximation of this formula, but the imbalance it creates appears in an astonishing number of places in large social systems.

No matter how you display it, this shape is very different from the bell curve distribution we are used to. Imagine going out into your community and measuring the height of two hundred men selected at random. For anything like height that falls on a bell curve, knowing any one of the numbers—average, median, or mode—is a clue to the others. If you know the height of the median man, or the most common height among all the men, you can make an educated guess about the average height. And most critically, whatever you know about the average height can be assumed to be most representative of the group.

Now imagine height were described not by a bell curve but by a power law. If the average height of two hundred men was five foot ten; the most frequent (or modal) height would be held by dozens of men who were each only a foot tall, the median height would be two feet tall (a hundred men shorter than two feet, and a hundred taller). Most important, in such a distribution, the five tallest men would be 40, 50, 66, 100,
ure since Vilfredo Pareto, in the early 1900s, found a power law phenomenon he studied; the distribution of wealth was ‘a predictable imbalance’ when applied to online retailers like Amazon.

Chris Anderson’s discussion of online retailers like Amazon shows how the generational distribution of wealth doesn’t apply just to social systems as well. Real-world distributions of this formula, but a surprising number of social systems share this same shape.

The shape is very different to the Gaussian distribution function of height two for anything like height, or one of the numbers—so the others. If you know the most common height in the distribution, whatever you known to be most represented and not by a bell curve but of two hundred men was modal) height would be such only a foot tall, the height of the men shorter than half the distribution. Most important, in such a distribution, the most active contributors to a Wikipedia article, the most avid tagger of Flickr photos, and the most vocal participant in a mailing list all tend to be much more active than the median participant, so active in fact that any measure of “average” participation becomes meaningless. There is a steep decline from a few wildly active participants to a large group of barely active participants, and though the average is easy to calculate, it doesn’t tell you much about any given participant.

Any system described by a power law, where mean, median, and mode are so different, has several curious effects. The first is that, by definition, most participants are below average. This sounds strange to many ears, as we are used to a world where average means middle, which is to say where average is the same as the median. You can see this “below average” phenomenon at work in the economist’s joke: Bill Gates walks into a bar, and suddenly everyone inside becomes a millionaire, on average. The corollary is that everyone else in the bar also acquires a below-average income. The other surprise of such systems is that as they get larger, the imbalance between the few and the many gets larger, not smaller. As we get more weblogs, or more MySpace pages, or more YouTube videos, the gap between the material that gets the most attention and merely average attention will grow, as will the gap between average and median.

You cannot understand Wikipedia (or indeed any large social system) by looking at any one user or even a small group and assuming they are representative of the whole. The most
active few users account for a majority of the edits, even though they make up a minority, and often a tiny minority, of contributors. But even this small group does not account for the whole success of Wikipedia, because many of these active users are doing things like correcting typos or making small changes, while users making only one edit are sometimes adding much larger chunks of relevant information.

Power law distributions tend to describe systems of interacting elements, rather than just collections of variable elements. Height is not a system—my height is independent of yours. My use of Wikipedia is not independent of yours, however, as changes I make show up for you, and vice versa. This is one of the reasons we have a hard time thinking about systems with power law distributions. We're used to being able to extract useful averages from small samples and to reason about the whole system based on those averages. When we encounter a system like Wikipedia where there is no representative user, the habits of mind that come from thinking about averages are not merely useless, they're harmful. To understand the creation of something like a Wikipedia article, you can't look for a representative contributor, because none exists. Instead, you have to change your focus, to concentrate not on the individual users but on the behavior of the collective.

The power law also helps explain the difference between the many small but tightly integrated clusters of friends using weblogs and the handful of the most famous and best-trafficked weblogs. The pressures are reflected in Figure 5-2, which shows the relationship between a power law distribution and the kinds of communication patterns that can be supported.
majority of the edits, even and often a tiny minority, of group does not account for because many of these active typing typos or making small one edit are sometimes event information.

do describe systems of intercollections of variable elegy height is independent of independent of yours, how or you, and vice versa. This rrd time thinking about sys.

i. We're used to being able at all samples and to reason those averages. When we where there is no representation from thinking about they're harmful. To understand a Wikipedia article, you butor, because none exists. xusc, to concentrate not on avor of the collective.

in the difference between d clusters of friends using most famous and best reflected in Figure 5-2, een a power law distribution patterns that can

![Diagram](image)

**Figure 5-2**: The relationship between audience size and conversational pattern. The curved line represents the power law distribution of weblogs ranked by audience size. Weblogs at the left-hand side of the graph have so many readers that they are limited to the broadcast pattern, because you can't interact with millions of readers. As size of readership falls, loose conversation becomes possible, because the audiences are smaller. The long tail of weblogs, with just a few readers each, can support tight conversation, where every reader is also a writer and vice versa.

As is normal in a power law distribution, most writers have few readers. Such readers and writers can all pay similar amounts of attention to one another, forming relatively tight conversational clusters. (This is the pattern of small groups of friends using weblog or social networking tools, described in the last chapter.) As the audience grows larger, into the hundreds, the tight pattern of “everyone connected to everyone” becomes impossible to support — conversation is still possible, but it is in a community that is much more loosely woven. And with thousands of people paying attention, much less millions, fame starts to kick in. Once writers start getting more attention than they can return, they are forced into a width-versus-depth tradeoff. They can spend less time talking
to everyone. (It's no accident we call these interactions shallow and say that people who have them are stretched thin.) Alternatively, they can limit themselves to deeper interactions with a few people (in which case we call them cliquish or standoffish). At the extremes they are forced to adopt both strategies, to limit both the number and the depth of interactions. A wedding reception is a localized version of this tradeoff. The bride and groom gather a room full of people they could talk to for hours, then talk to most of the guests for just a few minutes each so as not to be rude.

Why Would Anyone Bother?

Coase's logic in "The Nature of the Firm" suggests that in organizing any group, the choice is between management and chaos; he assumes that it's very difficult to create an unmanaged but nonchaotic group. But lack of managerial direction makes it easier for the casual contributor to add something of value; in economic terms, an open social system like Wikipedia dramatically reduces both managerial overhead and disincentives to participation. Even understanding how a wiki page comes into being does nothing to answer the hardest question of all: Why would anyone contribute to a wiki in the first place? The answer may be easiest to illustrate with a personal example.

I recently came across a Wikipedia entry for Koch snowflake, one of a curious bestiary of mathematical shapes called fractals (shapes that have the same pattern at many scales, like a fern leaf). The article had an animated image showing the
these interactions shallow em are stretched thin.) yes to deeper interactions we call them cliquish or are forced to adopt both and the depth of interacted version of this trade-room full of people they lost of the guests for just de.

...rm" suggests that in or-ween management and ult to create an unman- of managerial direction tor to add something of il system like Wikipedia overhead and disincen- ding how a wiki page er the hardest question to a wiki in the first ustrate with a personal entry for Koch snow- ematical shapes called rm at many scales, like x image showing the

snowflake in various stages of construction, accompanied by the following text:

A Koch snowflake is the limit of an infinite construction that starts with a triangle and recursively replaces each line segment with a series of four line segments that form a triangular "bump." Each time new triangles are added (an iteration), the perimeter of this shape grows by a factor of 4/3 and thus diverges to infinity with the number of iterations. The length of the Koch snowflake's boundary is therefore infinite, while its area remains finite.

This description is accurate but a little awkward. I rewrote it to read:

To create a Koch snowflake, start with an equilateral triangle and replace the middle third of every line segment with a pair of line segments that form an equilateral "bump." Then perform the same replacement on every line segment of the resulting shape, ad infinitum. With every iteration, the perimeter of this shape grows by 4/3rds. The Koch snowflake is the result of an infinite number of these iterations, and has an infinite length, while its area remains finite.

This rewrite describes the same shape but in a way that is a little easier to grasp.

Why did I do it? Nothing in my daily life has anything to do with fractals, and besides, I was improving the article not...
for me but for subsequent readers. Psychological introspection is always a tricky business, but I know of at least three reasons I rewrote that description. The first was a chance to exercise some unused mental capacities—I studied fractals in a college physics course in the 1980s and was pleased to remember enough about the Koch snowflake to be able to say something useful about it, however modest.

The second reason was vanity—the "Kilroy was here" pleasure of changing something in the world, just to see my imprint on it. Making a mark on the world is a common human desire. In response to mass-produced technology with no user-serviceable parts inside, we install ringtones and screensavers, as a way to be able to change something about our inflexible tools. Wikipedia lets users make a far more meaningful contribution than deciding whether your phone should ring with the 1812 Overture or "Holla Back Girl."

This desire to make a meaningful contribution where we can is part of what drives Wikipedia's spontaneous division of labor. You may have noticed that I accidentally introduced a mistake in my edit, writing "ad infinitum" when I should have written "ad infinitum." I missed this at the time I wrote the entry, but the other users didn't; shortly after I posted my change, someone went in and fixed the spelling. My mistake had been fixed, my improvement improved. To propose my edit, I only had to know a bit about the Koch snowflake; there are many more people like me than there are mathematicians who understand the Snowflake in all its complexity. Similarly, fixing my typo required no knowledge of the subject at all; as a result, the number of potential readers who could fix my mistake was larger still, and because the fix was so simple,
lers. Psychological introspec-
but I know of at least three
on. The first was a chance to
pacities—I studied fractals in
980s and was pleased to re-
snowflake to be able to say
ver modest.
—the “Kilroy was here” plea-
the world, just to see my
on the world is a common
produced technology with
we install ringtones and
to change something about
its users make a far more
iding whether your phone
or “Holla Back Girl.”
ful contribution where we
its spontaneous division of
accidentally introduced a
atum” when I should have
is at the time I wrote the
shortly after I posted my
the spelling. My mistake
proved. To propose my
he Koch snowflake; there
here are mathematicians
its complexity. Similarly,
e of the subject at all; as
aders who could fix my
the fix was so simple,

they did not need to have the same motivations I did. (If you
noticed that error as printed here and were annoyed by it,
consider whether that would have been enough to get you to
fix it if you could.) It’s obvious how Wikipedia takes advantage
of different kinds of knowledge—someone who knows about
World War II tank battles and someone who knows the rules
of Texas hold’em are going to contribute to different articles.
What’s less obvious is how it takes advantage of skills other
than knowledge. Rewriting a sentence to express the same
thought more readably is a different skill from finding and
fixing spelling errors, and both of those differ from knowing
the rules of poker, but all those skills are put to good use
by Wikipedia.

The third motivation was the desire to do a good thing. This
motivation, of all of them, is both the most surprising and the
most obvious. We know that nonfinancial motivations are
everywhere. Encyclopedias used to be the kind of thing that
appeared only when people paid for them, yet Wikipedia re-
quires no fees from its users, nor payments to its contributors.
The genius of wikis, and the coming change in group effort in
general, is in part predicated on the ability to make nonfinan-
cial motivations add up to something of global significance.

Yochai Benkler, a legal scholar and network theorist and
author of The Wealth of Networks, calls nonmarket creation of
group value “commons-based peer production” and draws at-
tention to the ways people are happy to cooperate without
needing financial reward. Wikipedia is peer production par
excellence, set up to allow anyone who wants to edit an article
to do so, for any and all reasons except getting paid.

There’s an increasing amount of evidence, in fact, that
specific parts of our brain are given over to making economically irrational but socially useful calculations. In one well-known experiment, called the Ultimatum game, two people divide ten dollars between them. The first person is given the money and can then divide it between the two of them in any way he likes; the only freedom the second person has is to take or leave the deal for both of them. Pure economic rationality would suggest that the second person would accept any split of the money, down to a $9.99-to-$0.01 division, because taking even a penny would make him better off than before. In practice, though, the recipient would refuse to accept a division that was seen as too unequal (less than a $7-to-$3 split, in practice) even though this meant that neither person received any cash at all. Contrary to classical economic theory, in other words, we have a willingness to punish those who are treating us unfairly, even at personal cost, or, to put it another way, a preference for fairness that is more emotional than rational. This in turn suggests that relying on nonfinancial motivations may actually make systems more tolerant of variable participation.

We also have practical evidence that when a perceived bargain changes, previously contented volunteers will defect. America Online built its business as a user-friendly entry point into digital networks, and much of its friendliness came directly from AOL’s users, many of whom loved the service so much that they worked as volunteer guides. After AOL’s stock price rose into the stratosphere, however, a number of those guides banded together to file a class-action suit, claiming AOL had unfairly profited from their work. Nothing had changed about the job they were being asked to do; everything
changed about the financial context they did it in, and that was enough to poison their goodwill. (Though the case is still pending, AOL has dropped the volunteer guide program.)

Social Prosthetics

The question every working wiki asks of its users is "Who cares?" Who cares that an article on asphalt exists? Cdani does. Who cares that it include photos? SCEhardt does. Who cares that the Koch snowflake description be clear? I do. Wikis reward those who invest in improving them. This explains why both experts and amateurs are willing to contribute—the structure of participation is not tied to extrinsic rewards, so people capable of adding to the technical explanation of complex mathematical shapes end up working alongside people who only know enough to be able to proofread descriptions of same. This reward, and the loyalty it creates, help explain one of the most complex questions about Wikipedia's continued success: How does it survive both disagreement and vandalism? Openness, division of labor, and the multiple motivations of its users drive its rising average quality, but none of those things explain why articles on contentious subjects aren't damaged by editing wars among rival factions, or simply destroyed by vandals, who can delete an entire article with the click of a button. Why don't these sorts of things happen? Or to ask the same question in the language of economics: Why doesn't Wikipedia suffer from the Tragedy of the Commons? Why haven't free riders and even vandals destroyed it?

The wiki format is another version of publish-then-filter;
coercion is applied after the fact rather than before. All edits are provisional, so any subsequent reader can decide that a change to an article is unacceptable, to be further edited or to be deleted. This capability is universal; any edit or deletion can be further edited or undone ("reverted"), changes that are themselves then held up for still more scrutiny, ad infinitum. Every change to a Wikipedia article is best thought of as a proposed edit; it shows up the minute it is made, but it is still subject to future review and revision. (I checked back on the Koch snowflake article later and was pleased to see my changes had survived such review.) In the case of obvious vandalism, the review process happens astonishingly quickly. Martin Wattenberg and Fernanda Viegas, researchers at IBM who study Wikipedia, have documented a number of contentious articles on subjects like abortion and Islam where complete deletions of the articles' contents have been restored in less than two minutes.

Like everything described in this book, a wiki is a hybrid of tool and community. Wikipedia, and all wikis, grow if enough people care about them, and they die if they don't. This last function is part of any working wiki, but it isn't part of the wiki software, it's part of the community that uses the software. If even only a few people care about a wiki, it becomes harder to harm it than to heal it. (Imagine a world where it was easier to clean graffiti off a wall than to put it there in the first place.) When a vandalized page reappears as if nothing has happened, it creates the opposite of the "Kilroy was here" feeling of a successful edit—nothing is more frustrating to a vandal than investing energy to change something and then have that effort disappear in seconds. Evidence that
the fact rather than before. All edits subsequent reader can decide that accept, to be further edited or to be universal; any edit or deletion can be ("reverted"), changes that are still more scrutiny, ad infinitum. A article is best thought of as a at the minute it is made, but it is still a revision. (I checked back on the and was pleased to see my changes.)

In the case of obvious vandalism, we astonishingly quickly. Martin Viegas, researchers at IBM who mented a number of contentious option and Islam where complete intents have been restored in less ed in this book, a wiki is a hybrid Wikipedia, and all wikis, grow if them, and they die if they don't. any working wiki, but it isn't part of the community that uses the v people care about a wiki, it behan to heal it. (Imagine a world a graffiti off a wall than to put it en a vandalized page reappears as creates the opposite of the "Kilroy successful edit—nothing is more frust sting energy to change something appear in seconds. Evidence that enough people care about an article, and that they have both the will and the tools to quickly defend it, has proven enough to demoralize most vandals.

As with every fusion of group and tool, this defense against vandalism is the result not of a novel technology alone but of a novel technology combined with a novel social strategy. Wikis provide ways for groups to work together, and to defend the output of that work, but these capabilities are available only when most of the participants are committed to those outcomes. When they are not, creating a wiki can be an exercise in futility, if not an outright disaster. One notable example was the Los Angeles Times "Wikitorial" effort, in which the content of the paper's editorial pages was made available to the public. The Times announced the experiment in a bid to drive users there, and drive them they did. A group of passionate and committed users quickly arrived and set about destroying the experiment, vandalizing the posted editorials with off-topic content and porn. The Wikitorial had been up for less than forty-eight hours when a Times staffer was told to simply pull the plug. The problem the Times suffered from was simple: no one cared enough about the contents of the Wikitorial to defend it, much less improve it. An editorial is meant to be a timely utterance of a single opinionated voice—the opposite of the characteristics that make for good wiki content. A wiki augments community rather than replacing it; in the absence of a functioning community, a wiki will suffer from the Tragedy of the Commons, as the Wikitorial did, as individuals use it as an attention-getting platform, and there is no comm unity to defend it.

One of the extreme defensive strategies for Wikipedia is
hold up Wikipedia as a beacon of pure openness, but the curious fact is that many of Wikipedia's most vociferous boosters actually don't know much about its inner workings and want to regard it, wrongly, as an experiment in communal anarchy. The people most enamored of describing Wikipedia as the product of a free-form hive mind don't understand how Wikipedia actually works. It is the product not of collectivism but of unending argumentation. The articles grow not from harmonious thought but from constant scrutiny and emendation.

The idea behind Nupedia was that it should be possible to improve on traditional encyclopedias by keeping the process but dropping the commercial aspect. This turned out to be a bad idea, because much of the process for creating a traditional encyclopedia has less to do with encyclopedias than with institutional imperatives. Once you dispense with the institutional dilemma, as Wikipedia does, it is possible to dispense with much institutional process as well. Wikipedia invites us to do the following disorienting math: a chaotic process, with unpredictable and wildly uneven contributions, made by nonexpert contributors acting out of variable motivations, is creating a global resource of tremendous daily value. A commercial producer of encyclopedias has to be efficient about finding and fixing mistakes, since things like process and deadlines and salaries are involved. Wikipedia, with none of those things, does not have to be efficient—it merely has to be effective. If enough people see an article, the chance that an error will be caught and fixed improves with time. Because Wikipedia is a process, not a product, it replaces guarantees offered by institutions with probabilities supported by process: if enough people...
the ability to lock a page, preventing all but a few of the most committed Wikipedians from editing it until passions have cooled. (Pages can be locked in the face of sustained vandalism as well, but at any given time less than half a percent of pages are locked.) In addition there have been crises of validity: in 2005 the journalist John Seigenthaler, Sr., discovered that he had a biography on Wikipedia and that it contained scurrilous and false accusations about his involvement in the Kennedy assassinations. The entry was then fixed, but by that time the false material had been in place for half a year, so much of the damage had been done. Then in 2006 a longtime Wikipedia editor essay claimed, among other things, that he had a doctorate in theology and worked as a tenured professor at a private university. In fact, he had dropped out of a community college and had no degree or academic job of any sort. Both of these events demonstrated weaknesses in Wikipedia's methods, and in the aftermath of each one the Wikimedia foundation instituted new rules, including special proposals for handling biographies of the living, as well as restricting the ability of unregistered users to create articles from scratch.

The locking of pages and the restrictions put in place after the Seigenthaler and essayan affairs contrast with Wikipedia's general goal of openness. The Wikipedians are acutely aware of this conflict and as a result the design philosophy hews to Cunningham's original work: let the community do as much as they possibly can, but where they can't do the work on their own, add technological fixes. Wikipedia is predicated on openness not as a theoretical way of working but as a practical one. This pragmatism often comes as a shock to people who...
care enough about an article to read it, then enough people will care enough to improve it, and over time this will lead to a large enough body of good enough work to begin to take both availability and quality of articles for granted, and to integrate Wikipedia into daily use by millions.

Love as a Renewable Building Material

The Ise Shrine, a Shinto shrine in Ise, Japan, has occupied its current site for over thirteen hundred years. Despite its advanced age, however, UNESCO, the UN cultural agency, refused to list the shrine in its list of historic places. Why? Because the shrine is made out of wood, never a material prized for millennium-scale structural integrity, and so it can't be thirteen hundred years old. The Imbe priests who keep the shrine know that too, but they have a solution. They periodically tear the shrine to the ground, and then, using wood cut from the same forest that the original was built from, they rebuild the shrine to the same plan, on an adjacent spot. They do this every couple of decades and have done it sixty-one times in a row. (The next rebuilding will be in 2033.) Because the purpose of the shrine is in part to delineate the difference between sacred and ordinary space, from their point of view they have a thirteen-hundred-year-old shrine, built out of renewable materials. This argument didn't wash with UNESCO; the places they list enjoy the solidity of edifice, not of process. A wrecked castle that has stood unused for five hundred years makes the cut; a shrine that is rebuilt once a generation for a thousand years doesn't.
read it, then enough people will over time this will lead to a large work to begin to take both available for granted, and to integrate lions.

Living Material

In Ise, Japan, has occupied its hundred years. Despite its adoption by the UN cultural agency, a list of historic places. Why it of wood, never a material of integrity, and so it can’t be Imbe priests who keep the stone a solution. They periodically and then, using wood cut originally was built from, they m on an adjacent spot. They have done it sixty-one-ng will be in 2013.) Because rt to delineate the difference ce, from their point of view the old shrine, built out of re-didn’t wash with UNESCO: ity of edifice, not of process used for five hundred years until once a generation for a

Wikipedia is a Shinto shrine; it exists not as an edifice but as an act of love. Like the Ise Shrine, Wikipedia exists because enough people love it and, more important, love one another in its context. This does not mean that the people constructing it always agree, but loving someone doesn’t preclude arguing with them (as your own experience will doubtless confirm). What love does for Wikipedia is provide the motivation both for improvement and for defense. If the company that makes Encyclopaedia Britannica were to go out of business tomorrow, its core product would slowly decay as new knowledge was accrued without being reflected in subsequent editions. This concept, sometimes called the half-life of knowledge (in metaphorical comparison to radioactive decay), would render Britannica obsolete as the years wore on. If the people who love Wikipedia all lost interest at the same time, on the other hand, it would vanish almost instantly. The vandals and special interest groups who are constantly fighting to alter articles fail only because people care about Wikipedia, both article by article and as a whole, and because Wikipedia as a tool provides them with the weapons to fight those groups. Those weapons are taken up only by people who are willing to fight. Were that willingness to fade, the most contentious articles on Wikipedia, the articles on abortion and Islam and evolution, would be gone within hours, and it’s unlikely that the whole enterprise would survive a week.

We don’t often talk about love when trying to describe the public world, because love seems too squishy and too private. What has happened, though, and what is still happening in our historical moment, is that love has become a lot less squishy and a lot less private. Love has a half-life too, as well
as a radius, and we're used to both of those being small. We can affect the people we love, but the longevity and social distance of love are both constrained. Or were constrained—now we can do things for strangers who do things for us, at a low enough cost to make that kind of behavior attractive, and those effects can last well beyond our original contribution. Our social tools are turning love into a renewable building material. When people care enough, they can come together and accomplish things of a scope and longevity that were previously impossible; they can do big things for love.