

INFORMATION
ARBITRAGE™

GATHER DATA
PERSONALIZE

Embrace dumb power

Success is nonlinear

More gives more

Anticipate the cheap

Let go at the top

Make virtuous circles

New Rules for the

By Kevin Kelly

Twelve dependable principles

QUALITY
CONNECTIONS™

The Digital Revolution gets all the headlines these days. But turning slowly beneath the fast-forward turbulence, steadily driving the gyrating cycles of cool technogadgets and gotta-haves, is a much more profound revolution - the Network Economy.

This emerging new economy represents a tectonic upheaval in our commonwealth, a social shift that reorders our lives more than mere hardware or software ever can. It has its own distinct opportunities and its own new rules. Those who play by the new rules will prosper; those who ignore them will not.

The advent of the new economy was first noticed as far back as 1969, when Peter Drucker perceived the arrival of knowledge workers. The new economy is often referred to as the Information Economy, because of information's superior role (rather than material resources or capital) in creating wealth.

I prefer the term Network Economy, because *information* isn't enough to explain the discontinuities we see. We have been awash in a steadily increasing tide of information for the past century. Many successful knowledge businesses have been built on information capital, but only recently has a total reconfiguration of information itself shifted the whole economy.

The grand irony of our times is that the era of computers is over. All the major consequences of stand-alone computers have already taken place. Computers have speeded up our lives a bit, and that's it.

In contrast, all the most promising technologies

making their debut now are chiefly due to communication between computers - that is, to connections rather than to computations. And since communication is the basis of culture, fiddling at this level is indeed momentous.

And fiddle we do. The technology we first invented to crunch spreadsheets has been hijacked to connect our isolated selves instead. Information's critical rearrangement is the widespread, relentless act of connecting everything to everything else. We are now engaged in a grand scheme to augment, amplify, enhance, and extend the relationships and communications between all beings and all objects. That is why the Network Economy is a big deal.

The new rules governing this global restructuring revolve around several axes. First, wealth in this new regime flows directly from innovation, not optimization; that is, wealth is not gained by perfecting the known, but by imperfectly seizing the unknown. Second, the ideal environment for cultivating the unknown is to nurture the supreme agility and nimbleness of networks. Third, the domestication of the unknown inevitably means abandoning the highly successful known - undoing the perfected. And last, in the thickening web of the Network Economy, the cycle of "find, nurture, destroy" happens faster and more intensely than ever before.

The Network Economy is not the end of history. Given the rate of change, this economic arrangement may not endure more than a generation or two. Once

VIRTUAL
INTEL
COMMUNITY
NETWORK
ECONOMY

The net wins

Significance precedes momentum

Don't solve problems

Follow the free

Feed the web first

Seek disequilibrium

www.wired.com/5.09/networkeconomy/

New Economy ▶

for thriving in a turbulent world ▶

networks have saturated every space in our lives, an entirely new set of rules will take hold. Take these principles, then, as rules of thumb for the interim.

1 The Law of Connection Embrace dumb power

The Network Economy is fed by the deep resonance of two stellar bangs: the collapsing microcosm of chips and the exploding telecosm of connections. These sudden shifts are tearing the old laws of wealth apart and preparing territory for the emerging economy.

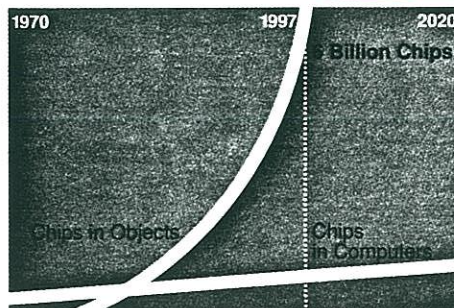
As the size of silicon chips shrinks to the microscopic, their costs shrink to the microscopic as well. They become cheap and tiny enough to slip into every - and the key word here is *every* - object we make. The notion that all doors in a building should contain a computer chip seemed ludicrous 10 years ago, but now there is hardly a hotel door without a blinking, beeping chip. Soon, if National Semiconductor gets its way, every FedEx package will be stamped with a disposable silicon flake that smartly tracks the contents. If an ephemeral package can have a chip, so can your chair, each book, a new coat, a basketball. Thin slices of plastic known as smart cards hold a throwaway chip smart enough to be your banker. Soon, all manufactured objects, from tennis shoes to hammers to

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lamp shades to cans of soup, will have embedded in them a tiny sliver of thought. And why not?

The world is populated by 200 million computers. Andy Grove of Intel happily estimates that we'll see 500 million of these by 2002. Yet the number of non-computer chips now pulsating in the world is 6 billion! They are already embedded in your car and stereo and rice cooker. Because they can be stamped out fast and cheap, like candy gumdrops, these chips are known in the industry as "jelly beans." And we

STANDARDS FOR DINNER WITH A BAW JAW BEANS?



SOURCE: DATAQUEST

We are moving from crunching to connecting. While the number of computer chips is rising, the number of chips in objects other than computers is rising faster. When these myriad low-power chips are connected, we get very powerful results.

are in the dawn of a jelly bean explosion: there'll be 10 billion grains of working silicon by 2005, a billion not long after. Someday each of them may be as smart as an ant, dissolved into our habitat.

As we implant a billion specks of our thought into everything we make, we are also connecting them up. Stationary objects are wired together. The nonstationary rest - that is, most manufactured objects - will be

linked by infrared and radio, creating a wireless web vastly larger than the wired web. It is not necessary that each connected object transmit much data. A tiny chip plastered inside a water tank on an Australian ranch transmits only the telegraphic message of whether it is full or not. A chip on the horn of each steer beams out his pure location, nothing more: "I'm here, I'm here." The chip in the gate at the end of the road communicates only when it was last opened: "Tuesday."

The glory of these connected crumbs is that they don't need to be artificially intelligent. Instead, they work on the dumb power of a few bits linked together. Dumb power is what you get when you network dumb nodes into a smart web. It's what our brains do with dumb neurons and what the Internet did with dumb personal computers. A PC is the conceptual equivalent of a single neuron housed in a plastic case. When linked by the telecosm into a neural network, these dumb PC nodes created that fabulous intelligence called the World Wide Web. It works in other domains: dumb parts, properly connected, yield smart results.

A trillion dumb chips connected into a hive mind is the hardware. The software that runs through it is the Network Economy. A planet of hyperlinked chips emits a ceaseless flow of small messages, cascading into the most nimble waves of sensibility. Every farm moisture sensor shoots up data, every weather satellite beams down digitized images, every cash register spits out bit streams, every hospital monitor trickles out numbers, every Web site tallies attention, every vehicle transmits its location code; all of this is sent swirling into the web. That tide of signals is the net. *Privacy?*

The net is not just humans typing at each other on AOL, although that is part of it too and will be as long as seducing the romantic and flaming the idiotic are enjoyable. Rather, the net is the collective interaction spun off by a trillion objects and living beings, linked together through air and glass.

This is the net that begets the Network Economy. According to MCI, the total volume of voice traffic on global phone systems will be superseded by the total volume of data traffic in three years. We're already on the way to an expanded economy full of new participants: agents, bots, objects, and machines, as well as several billion more humans. We won't wait for AI to make intelligent systems; we'll do it with the dumb power of ubiquitous computing and pervasive connections.

The whole shebang won't happen tomorrow, but the trajectory is clear. We are connecting all to all. Every step we take that banks on cheap, rampant, and universal connection is a step in the right direction. Furthermore, the surest way to advance massive connectionism is to exploit decentralized forces - to link the distributed bottom. How do you make a better bridge? Let the parts talk to each other. How do you improve lettuce farming? Let the soil speak to the farmer's tractors. How do you make aircraft safe?

Let the airplanes communicate among themselves and pick their own flight paths.

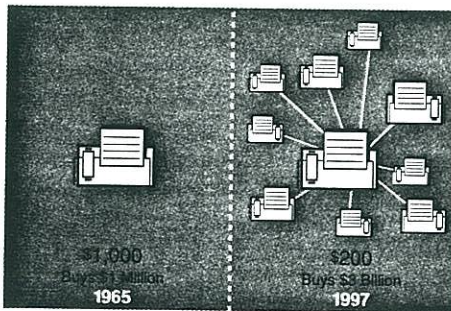
In the Network Economy, embrace dumb power.

2 The Law of Plentitude More gives more

Curious things happen when you connect all to all. Mathematicians have proven that the sum of a network increases as the square of the number of members. In other words, as the number of nodes in a network increases arithmetically, the value of the network increases exponentially. Adding a few more members can dramatically increase the value for all members.

Consider the first modern fax machine that rolled off the conveyor belt around 1965. Despite millions of dollars spent on its R&D, it was worth nothing. Zero. The second fax machine to roll off immediately made the first one worth something. There was someone to fax to. Because fax machines are linked into a network, each additional fax machine sliding down the chute increases the value of all the fax machines operating before it.

So strong is this network value that anyone purchasing a fax machine becomes an evangelist for the fax network. "Do you have a fax?" fax owners ask you. "You should get one." Why? Your purchase increases the worth of their machine. And once you join the network, you'll begin to ask others, "Do you have a fax (or email, or Acrobat software, etc)?" Each additional account you can persuade onto the network substantially increases the value of your account.



The high price of the first modern fax machine, circa 1965, bought you one end of a communications device. The low price of a fax machine today buys you an entire network consisting of 18 million machines. Each additional unit sold increases the value of your machine.

When you go to Office Depot to buy a fax machine, you are not just buying a US\$200 box. You are purchasing for \$200 the entire network of all other fax machines and the connections between them - a value far greater than the cost of all the separate machines.

The fax effect suggests that the more plentiful things become, the more valuable they become. But this notion directly contradicts two of the most fundamental axioms we attribute to the industrial age.

First hoary axiom: Value came from scarcity; diamonds, gold, oil, and college degrees were precious because they were scarce.

Second hoary axiom: When things were made plentiful, they became devalued; carpets no longer

OSS TEAM
TO EVENT
INFO/COMMS
COMPETENCE
"DIGESTS"

OSS AS
ULTIMATE
MEMBER-
SHIP.

"CONNECTED"

DUMB
PEOPLE

=
SMART
NATION?

NO!