WIRED

New Rules for the New Economy

By Kevin Kelly

Twelve dependable principles for thriving in a turbulent world

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 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 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 noncomputer 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 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.

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.

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 indicated status when they could be woven by the thousands on machines.

The logic of the network flips these industrial lessons upside down. In a Network Economy, value is derived from plentitude, just as a fax machine's value increases in ubiquity. Power comes from abundance. Copies (even physical copies) are cheap. Therefore, let them proliferate.

Instead, what is valuable is the scattered relationships - sparked by the copies - that become tangled up in the network itself. And the relationships rocket upward in value as the parts increase in number even slightly. Windows NT, fax machines, TCP/IP, GIF images, RealAudio - all born deep in the Network Economy - adhere to this logic. But so do metric wrenches, triple-A batteries, and other devices that rely on universal standards; the more common they are, the more it pays you to stick to that standard.

In the future, cotton shirts, bottles of vitamins, chain saws, and the rest of the industrial objects in the world will also obey the law of plentitude as the cost of producing an additional copy of them falls steeply, while the value of the network that invents, manufactures, and distributes them increases.

In the Network Economy, scarcity is overwhelmed by shrinking marginal costs. Where the expense of churning out another copy becomes trivial (and this is happening in more than software), the value of standards and the network booms.

In the Network Economy, more gives more.

3 The Law of Exponential Value

Success is nonlinear

The chart of Microsoft's cornucopia of profits is a revealing graph because it mirrors several other plots of rising stars in the Network Economy. During its first 10 years, Microsoft's profits were negligible. Its profits rose above the background noise only around 1985. But once they began to rise, they exploded.

Federal Express experienced a similar trajectory: years of minuscule profit increases, slowly ramping up to an invisible threshold, and then surging skyward in a blast sometime during the early 1980s.

The penetration of fax machines likewise follows a tale of a 20-year overnight success. Two decades of marginal success, then, during the mid-1980s, the number of fax machines quietly crosses the point of no return - and the next thing you know, they are irreversibly everywhere.

The archetypical illustration of a success explosion in a Network Economy is the Internet itself. As any old-time nethead will be quick to lecture you, the Internet was a lonely (but thrilling!) cultural backwater for two decades before it hit the media radar. A graph of the number of Internet hosts worldwide, starting in the 1960s, hardly creeps above the bottom line. Then, around 1991, the global tally of hosts suddenly mushrooms, exponentially arcing up to take over the world.

Each of these curves (I owe Net Gain author John Hagel credit for these four examples) is a classic template of exponential growth, compounding in a nonlinear way. Biologists know about exponential growth; such curves are almost the definition of a biological system. That's one reason the Network Economy is often described more accurately in biological terms. Indeed, if the Web feels like a frontier, it's because for the first time in history we are witnessing biological growth in technological systems.

At the same time, each of the above examples is a classic model of the Network Economy. The compounded successes of Microsoft, FedEx, fax machines, and the Internet all hinge on the prime law of networks: value explodes exponentially with membership, while this value explosion sucks in yet more members. The virtuous circle inflates until all potential members are joined.

The subtle point from these examples, however, is that this explosion did not ignite until approximately the late 1980s. Something happened then. That something was the dual big bangs of jelly bean chips and collapsing telco charges. It became feasible - that is, dirt cheap - to exchange data almost anywhere, anytime. The net, the grand net, began to nucleate. Network power followed.

Now that we've entered the realm where virtuous circles can unfurl overnight successes in a biological way, a cautionary tale is in order. One day, along the beach, tiny red algae blooms into a vast red tide. Then, a few weeks later, just when the red mat seems indelible, it vanishes. Lemmings boom and disappear. The same biological forces that amplify populations can mute them. The same forces that feed on each other to amplify network presences into powerful overnight standards can also work in reverse to unravel them in a blink. Small beginnings can lead to large results, while large disturbances have only small effects.

In the Network Economy, success is nonlinear.

4 The Law of Tipping Points

Significance precedes momentum

There is yet one more lesson to take from these primeval cases of the Network Economy. And here, another biological insight will be handy. In retrospect, one can see from these expo-curves that a point exists where the momentum was so overwhelming that success became a runaway event. Success became infectious, so to speak, and spread pervasively to the extent that it became difficult for the uninfected to avoid succumbing. (How long can you hold out not having a phone?)

In epidemiology, the point at which a disease has infected enough hosts that the infection moves from local illness to raging epidemic can be thought of as the tipping point. The contagion's momentum has tipped from pushing uphill against all odds to rolling downhill with all odds behind it. In biology, the tipping points of fatal diseases are fairly high, but in technology, they seem to trigger at much lower percentages of victims or members.

There has always been a tipping point in any business, industrial or network, after which success feeds upon itself. However, the low fixed costs, insignificant marginal costs, and rapid distribution that we find in the Network Economy depress tipping points below the levels of industrial times; it is as if the new bugs are more contagious - and more potent. Smaller initial pools can lead to runaway dominance.

Lower tipping points, in turn, mean that the threshold of significance - the period before the tipping point during which a movement, growth, or innovation must be taken seriously - is also dramatically lower than it was during the industrial age. Detecting events while they are beneath this threshold is essential.

Major US retailers refused to pay attention to TV home-shopping networks during the 1980s because the number of people watching and buying from them was initially so small and marginalized that it did not meet the established level of retail significance. Instead of heeding the new subtle threshold of network economics, the retailers waited until the alarm of the tipping point sounded, which meant, by definition, that it was too late for them to cash in.

In the past, an innovation's momentum indicated significance. Now, in the network environment, significance precedes momentum.

Biologists tell a parable of the lily leaf, which doubles in size every day. The day before it completely covers the pond, the water is only half covered, and the day before that, only a quarter covered, and the day before that, only a measly eighth. So, while the lily grows imperceptibly all summer long, only in the last week of the cycle would most bystanders notice its "sudden" appearance. But by then, it is far past the tipping point.

The Network Economy is a lily pond. The Web, as one example, is a leaf doubling in size every six months. MUDs and MOOs, Teledesic phones, wireless data ports, collaborative bots, and remote solid state sensors are also leaves in the network lily pond. Right now, they are just itsy-bitsy lily cells merrily festering at the beginning of a hot network summer.

In the Network Economy, significance precedes momentum.

5 The Law of Increasing Returns

Make virtuous circles

The prime law of networking is known as the law of increasing returns. Value explodes with membership, and the value explosion sucks in more members, compounding the result. An old saying puts it more succinctly: Them that's got shall get.

We see this effect in the way areas such as Silicon Valley grow; each new successful start-up attracts other start-ups, which in turn attract more capital and skills and yet more start-ups. (Silicon Valley and other high tech industrial regions are themselves tightly coupled networks of talent, resources, and opportunities.)

The law of increasing returns is far more than the textbook notion of economies of scale. In the old rules, Henry Ford leveraged his success in selling cars to devise more efficient methods of production. This enabled Ford to sell his cars more cheaply, which created larger sales, which fueled more innovation and even better production methods, sending his company to the top. While the law of increasing returns and the economies of scale both rely on positive feedback loops, the former is propelled by the amazing potency of net power, and the latter isn't. First, industrial economies of scale increase value linearly, while the prime law increases value exponentially - the difference between a piggy bank and compounded interest.

Second, and more important, industrial economies of scale stem from the herculean efforts of a single organization to outpace the competition by creating value for less. The expertise (and advantage) developed by the leading company is its alone. By contrast, networked increasing returns are created and shared by the entire network. Many agents, users, and competitors together create the network's value. Although the gains of increasing returns may be reaped unequally by one organization over another, the value of the gains resides in the greater web of relationships.

Huge amounts of cash may pour toward network winners such as Cisco or Oracle or Microsoft, but the supersaturated matrix of increasing returns woven through their companies would continue to expand into the net even if those particular companies should disappear.

Likewise, the increasing returns we see in Silicon Valley are not dependent on any particular company's success. As AnnaLee Saxenian, author of Regional Advantage, notes, Silicon Valley has in effect become one large, distributed company. "People joke that you can change jobs without changing car pools," Saxenian told Washington Post reporter Elizabeth Corcoran. "Some say they wake up thinking they work for Silicon Valley. Their loyalty is more to advancing technology or to the region than it is to any individual firm."

One can take this trend further. We are headed into an era when both workers and consumers will feel more loyalty to a network than to any ordinary firm. The great innovation of Silicon Valley is not the wowie-zowie hardware and software it has invented, but the social organization of its companies and, most important, the networked architecture of the region itself - the tangled web of former jobs, intimate colleagues, information leakage from one firm to the next, rapid company life cycles, and agile email culture. This social web, suffused into the warm hardware of jelly bean chips and copper neurons, creates a true Network Economy.

The nature of the law of increasing returns favors the early. The initial parameters and conventions that give a network its very power quickly freeze into unalterable standards. The solidifying standards of a network are both its blessing and its curse - a blessing because from the de facto collective agreement flows the unleashed power of increasing returns, and a curse because those who own or control the standard are disproportionately rewarded.

But the Network Economy doesn't allow one without the other. Microsoft's billions are tolerated because so many others in the Network Economy have made their collective billions on the advantages of Microsoft's increasing-returns standards.

In a Network Economy, life is tricky for consumers, who must decide which early protocol to support. Withdrawing later from the wrong network of relationships is painful - but not as painful as companies who bet their whole lives on the wrong one. Nonetheless, guessing wrong about conventions is still better than ignoring network dynamics altogether. There is no future for hermetically sealed closed systems in the Network Economy. The more dimensions accessible to member input and creation, the more increasing returns can animate the network, the more the system will feed on itself and prosper. The less it allows these, the more it will be bypassed.

The Network Economy rewards schemes that allow decentralized creation and punishes those that don't. An automobile maker in the industrial age maintains control over all aspects of the car's parts and construction. An automobile maker in the Network Economy will establish a web of standards and outsourced suppliers, encouraging the web itself to invent the car, seeding the system with knowledge it gives away, engaging as many participants as broadly as possible, in order to create a virtuous loop where every member's success is shared and leveraged by all.

In the Network Economy, make virtuous circles.

6 The Law of Inverse Pricing

Anticipate the cheap

One curious aspect of the Network Economy would astound a citizen living in 1897: The very best gets cheaper each year. This rule of thumb is so ingrained in our contemporary lifestyle that we bank on it without marveling at it. But marvel we should, because this paradox is a major engine of the new economy.

Through most of the industrial age, consumers experienced slight improvements in quality for slight increases in price. But the arrival of the microprocessor flipped the price equation. In the information age, consumers quickly came to count on drastically superior quality for less price over time. The price and quality curves diverge so dramatically that it sometimes seems as if the better something is, the cheaper it will cost.

Computer chips launched this inversion, as Ted Lewis, author of The Friction Free Economy, points out. Engineers used the supreme virtues of computers to directly and indirectly create the next improved version of computers. By compounding our learning in this fashion, we got more out of less material. So potent is compounding chip power that everything it touches - cars, clothes, food - falls under its spell. Indirectly amplified learning by shrinking chips enabled just-in-time production systems and the outsourcing of very high tech manufacturing to low-wage labor - both of which lowered the prices of goods still further.

Today, shrinking chip meets exploding net. Just as we leveraged compounded learning in creating the microprocessor, we are leveraging the same multiplying loops in creating the global communications web. We use the supreme virtues of networked communications to directly and indirectly create better versions of networked communications.

Almost from their birth in 1971, microprocessors have lived in the realm of inverted pricing. Now, telecommunications is about to experience the same kind of plunges that microprocessor chips take - halving in price, or doubling in power, every 18 months - but even more drastically. The chip's pricing flip was called Moore's Law. The net's flip is called Gilder's Law, for George Gilder, a radical technotheorist who forecasts that for the foreseeable future (the next 25 years), the total bandwidth of communication systems will triple every 12 months.

The conjunction of escalating communication power with shrinking size of jelly bean nodes at collapsing prices leads Gilder to speak of bandwidth becoming free. What he means is that the price per bit transmitted slides down an asymptotic curve toward the free. An asymptotic curve is like Zero's tortoise: with each step forward, the tortoise gets closer to the limit but never actually reaches it. An asymptotic price curve falls toward the free without ever touching it, but its trajectory closely paralleling the free is what becomes important.

In the Network Economy, bandwidth is not the only thing headed this way. Mips-per-dollar calculations head toward the free. Transaction costs dive toward the free. Information itself - headlines and stock quotes - plunges toward the free. Indeed, all items that can be copied, both tangible and intangible, adhere to the law of inverted pricing and become cheaper as they improve. While it is true that automobiles will never be free, the cost per mile will dip toward the free. It is the function per dollar that continues to drop.

For consumers, this is heaven. For those hoping to make a buck, this will be a cruel world. Prices will eventually settle down near the free (gulp!), but quality is completely open-ended at the top. For instance, all-you-can-use telephone service someday will be essentially free, but its quality can only continue to ascend, just to keep competitive.

So how will the telcos - and others - make enough money for profit, R&D, and system maintenance? By expanding what we consider a telephone to be. Over time, any invented product is on a one-way trip over the cliff of inverted pricing and down the curve toward the free. As the Network Economy catches up to all manufactured items, they will all slide down this chute more rapidly than ever. Our job, then, is to create new things to send down the slide - in short, to invent items faster than they are commoditized.

This is easier to do in a network-based economy because the criss-crossing of ideas, the hyperlinking of relationships, the agility of alliances, and the nimble quickness of creating new nodes all support the constant generation of new goods and services where none were before.

And, by the way, the appetite for more things is insatiable. Each new invention placed in the economy creates the opportunity and desire for two more. While plain old telephone service is headed toward the free, I now have three phone lines just for my machines and will someday have a data "line" for every object in my house. More important, managing these lines, the data they transmit, the messages to me, the storage thereof, the need for mobility, all enlarge what I think of as a phone and what I will pay a premium for.

In the Network Economy, you can count on the best getting cheaper; as it does, it opens a space around it for something new that is dear. Anticipate the cheap.

7 The Law of Generosity

Follow the free

If services become more valuable the more plentiful they are (Law #2), and if they cost less the better and the more valuable they become (Law #6), then the extension of this logic says that the most valuable things of all should be those that are given away.

Microsoft gives away its Web browser, Internet Explorer. Qualcomm, which produces Eudora, the standard email program, is given away as freeware in order to sell upgraded versions. Some 1 million copies of McAfee's antivirus software are distributed free each month. And, of course, Sun passed Java out gratis, sending its stock up and launching a mini-industry of Java app developers.

Can you imagine a young executive in the 1940s telling the board that his latest idea is to give away the first 40 million copies of his only product? (It's what Netscape did 50 years later.) He would not have lasted a New York minute.

But now, giving away the store for free is an applauded, level-headed strategy that banks on the network's new rules. Because compounding network knowledge inverts prices, the marginal cost of an additional copy (intangible or tangible) is near zero. Because value appreciates in proportion to abundance, a flood of copies increases the value of all the copies. Because the more value the copies accrue, the more desirable they become, the spread of the product becomes self-fulfilling. Once the product's worth and indispensability is established, the company sells auxiliary services or upgrades, enabling it to continue its generosity and maintaining this marvelous circle.

One could argue that this frightening dynamic works only with software, since the marginal cost of an additional copy is already near zero. That would misread the universality of the inverted price. Made-with-atoms hardware is also following this force when networked. Cellular phones are given away to sell their services. We can expect to see direct-TV dishes - or any object with which the advantages of being plugged in exceed the diminishing cost of replicating the object - given away for the same reasons.

The natural question is how companies are to survive in a world of generosity. Three points will help.

First, think of "free" as a design goal for pricing. There is a drive toward the free - the asymptotic free - that, even if not reached, makes the system behave as if it does. A very small flat rate may have the same effects as flat-out free.

Second, while one product is free, this usually positions other services to be valuable. Thus, Sun gives Java away to help sell servers and Netscape hands out consumer browsers to help sell commercial server software.

Third, and most important, following the free is a way to rehearse a service's or a good's eventual fall to free. You structure your business as if the thing that you are creating is free in anticipation of where its price is going. Thus, while Sega game consoles are not free to consumers, they are sold as loss leaders to accelerate their eventual destiny as something that will be given away in a Network Economy.

Another way to view this effect is in terms of attention. The only factor becoming scarce in a world of abundance is human attention. Each human has an absolute limit of only 24 hours per day to provide attention to the millions of innovations and opportunities thrown up by the economy. Giving stuff away garners human attention, or mind share, which then leads to market share.

Following the free also works in the other direction. If one way to increase product value is to make products free, then many things now without cost hide great value. We can anticipate wealth by following the free.

In the Web's early days, the first indexes to this uncharted territory were written by students and given away. The indexes helped humans focus their attention on a few sites out of thousands and helped draw attention to the sites, so webmasters aided the indexers' efforts. By being available free, indexes became ubiquitous. Their ubiquity quickly led to explosive stock values for the indexers and enabled other Web services to flourish.

So what is free now that may later lead to extreme value? Where today is generosity preceding wealth? A short list of online candidates would be digesters, guides, cataloguers, FAQs, remote live cameras, Web splashes, and numerous bots. Free for now, each of these will someday have profitable companies built around them. These marginal functions now are not fringe; remember, for instance, that in the industrial age Readers Digest is the world's most widely read magazine, that TV Guide is more profitable than the three major networks it guides viewers to, and that the Encyclopaedia Britannica began as a compendium of articles by amateurs - not too dissimilar from FAQs.

But the migration from ad hoc use to commercialization cannot be rushed. One of the law of generosity's corollaries is that value in the Network Economy requires a protocommercial stage. Again, wealth feeds off ubiquity, and ubiquity usually mandates some level of sharing. The early Internet and the early Web sported amazingly robust gift economies; goods and services were swapped, shared generously, or donated outright - actually, this was the sole way to acquire things online. Idealistic as this attitude was, it was the only sane way to launch a commercial economy in the emerging space. The flaw that science fiction ace William Gibson found in the Web - its capacity to waste tremendous amounts of time - was in fact, as Gibson further noted, its saving grace. In a Network Economy, innovations must first be seeded into the inefficiencies of the gift economy to later sprout in the commercial economy's efficiencies.

It's a rare (and foolish) software outfit these days that does not introduce its wares into the free economy as a beta version in some fashion. Fifty years ago, the notion of releasing a product unfinished - with the intention that the public would help complete it - would have been considered either cowardly, cheap, or inept. But in the new regime, this precommercial stage is brave, prudent, and vital.

In the Network Economy, follow the free.

8 The Law of the Allegiance

Feed the web first

The distinguishing characteristic of networks is that they have no clear center and no clear outer boundaries. The vital distinction between the self (us) and the nonself (them) - once exemplified by the allegiance of the industrial-era organization man - becomes less meaningful in a Network Economy. The only "inside" now is whether you are on the network or off. Individual allegiance moves away from organizations and toward networks and network platforms. (Are you Windows or Mac?)

Thus, we see fierce enthusiasm from consumers for open architectures. Users are voting for maximizing the value of the network itself. Companies have to play this way, too. As consultant John Hagel argues, a company's primary focus in a networked world shifts from maximizing the firm's value to maximizing the value of the infrastructure whole. For instance, game companies will devote as much energy promoting the platform - the tangle of users, developers, hardware manufactures, etc. - as they do to their product. Unless their web thrives, they die.

The net is a possibility factory, churning out novel opportunities by the diskful. But unless this explosion is harnessed, it will drown the unprepared. What the computer industry calls "standards" is an attempt to tame the debilitating abundance of competing possibilities. Standards strengthen a network; their constraints solidify a pathway, allowing innovation and evolution to accelerate. So central is the need to tame the choice of possibilities that organizations must make the common standard their first allegiance. Companies positioned at the gateway to a standard will reap the largest rewards. But as a company prospers, so do those in its web.

A network is like a country. In both, the surest route to raising one's own prosperity is raising the system's prosperity. The one clear effect of the industrial age is that the prosperity individuals achieve is more closely related to their nation's prosperity than to their own efforts.

The net is like a country, but with three important differences:

1) No geographical or temporal boundaries exist - relations flow 24 by 7 by 365.

2) Relations in the Network Economy are more tightly coupled, more intense, more persistent, and more intimate in many ways than those in a country.

3) Multiple overlapping networks exist, with multiple overlapping allegiances.

Yet, in every network, the rule is the same. For maximum prosperity, feed the web first.

9 The Law of Devolution

Let go at the top

The tightly linked nature of any economy, but especially the Network Economy's ultraconnected constitution, makes it behave ecologically. The fate of individual organizations is not dependent entirely on their own merits, but also on the fate of their neighbors, their allies, their competitors, and, of course, on that of the immediate environment.

Some biomes in nature are shy of opportunities for life. In the Arctic there are only a couple of styles of living, and a species had better get good at one of them. Other biomes are chock full of opportunities, and those possibilities are in constant flux, appearing and retreating in biological time as species jockey toward maximum adaptability.

The rich, interactive, and highly plastic shape of the Network Economy resembles a biome seething with action. New niches pop up constantly and go away as fast. Competitors sprout beneath you and then gobble your spot up. One day you are king of the mountain, and the next day there is no

mountain at all.

Biologists describe the struggle of an organism to adapt in this biome as a long climb uphill, where uphill means greater adaptation. In this visualization, an organism that is maximally adapted to the times is situated on a peak. It is easy to imagine a commercial organization substituted for the organism. A company expends great effort to move its butt uphill, or to evolve its product so that it is sitting on top, where it is maximally adapted to the consumer environment.

All organizations (profit and nonprofit alike) face two problems as they attempt to find their peak of optimal fit. Both are amplified by a Network Economy in which turbulence is the norm.

First, unlike the industrial arc's relatively simple environment, where it was fairly clear what an optimal product looked like and where on the slow-moving horizon a company should place itself, it is increasingly difficult in the Network Economy to discern what hills are highest and what summits are false.

Big and small companies alike can relate to this problem. It's unclear whether one should strive to be the world's best hard disc manufacturer when the mountain beneath that particular peak may not be there in a few years. An organization can cheer itself silly on its way to becoming the world's expert on a dead-end technology. In biology's phrasing, it gets stuck on a local peak.

The harsh news is that getting stuck is a certainty in the new economy. Sooner, rather than later, a product will be eclipsed at its prime. While one product is at its peak, another will move the mountain by changing the rules.

There is only one way out. The organism must devolve. In order to go from one high peak to another, it must go downhill first and cross a valley before climbing uphill again. It must reverse itself and become less adapted, less fit, less optimal.

This brings us to the second problem. Organizations, like living beings, are hardwired to optimize what they know and to not throw success away. Companies find devolving a) unthinkable and b) impossible. There is simply no room in the enterprise for the concept of letting go - let alone the skill to let go - of something that is working, and trudge downhill toward chaos.

And it will be chaotic and dangerous down below. The definition of lower adaptivity is that you are closer to extinction. Finding the next peak is suddenly the next life-or-death assignment. But there is no alternative (that we know of) to leaving behind perfectly good products, expensively developed technology, and wonderful brands and heading down to trouble in order to ascend again in hope. In the future, this forced march will become routine.

The biological nature of this era means that the sudden disintegration of established domains will be as certain as the sudden appearance of the new. Therefore, there can be no expertise in innovation unless there is also expertise in demolishing the ensconced.

In the Network Economy, the ability to relinquish a product or occupation or industry at its peak will be priceless. Let go at the top.

10 The Law of Displacement

The net wins

Many observers have noted the gradual displacement in our economy of materials by information. Automobiles weigh less than they once did and perform better. The missing materials have been substituted with nearly weightless high tech know-how in the form of plastics and composite fiber materials. This displacement of mass with bits will continue in the Network Economy.

Whereas once the unique dynamics of the software and computer industry (increasing returns,

following the free, etc.) were seen as special cases within the larger "real" economy of steel, oil, automobiles, and farms, the dynamics of networks will continue to displace the old economic dynamics until network behavior becomes the entire economy.

For example, take the new logic of cars as outlined by energy visionary Amory Lovins. What could be more industrial-age than automobiles? However, chips and networks can displace the industrial age in cars, too. Most of the energy a car consumes is used to move the car itself, not the passenger. So, if the car's body and engine can be diminished in size, less power is needed to move the car, meaning the engine can be made yet smaller, which means that the car can be smaller yet, and so on down the similar slide of compounded value that microprocessors followed. That's because smart materials - stuff that requires increasing knowledge to invent and make - are shrinking the steel.

Detroit and Japan have designed concept cars built out of ultralightweight composite fiber material weighing about 1,000 pounds, powered by hybrid-electric motors. They take away the mass of radiator, axle, and drive shaft by substituting networked chips. Just as embedding chips in brakes made them safer, these lightweight cars will be wired with network intelligence to make them safer: a crash will inflate the intelligence of multiple air bags - think smart bubblepak.

The accumulated effect of this substitution of knowledge for material in automobiles is a hypercar that will be safer than today's car, yet can cross the continental US on one tank of fuel.

Already, the typical car boasts more computing power than your typical desktop PC, but what the hypercar promises, says Lovins, is not wheels with lots of chips, but a chip with wheels. A car can rightly be view as headed toward becoming a solid state module. And it will drive on a road system increasingly wired as a decentralized electronic network obeying the Network Economy's laws.

Once we see cars as chips with wheels, it's easier to imagine airplanes as chips with wings, farms as chips with soil, houses as chips with inhabitants. Yes, they will have mass, but that mass will be subjugated by the overwhelming amount of knowledge and information flowing through it, and, in economic terms, these objects will behave as if they had no mass at all. In that way, they migrate to the Network Economy.

Nicholas "Atoms-to-Bits" Negroponte guesstimates that the Network Economy will reach $1 trillion by 2000. What this figure doesn't represent is the scale of the economic world that is moving onto the Internet - that grand net of interconnected objects - as the Network Economy infiltrates cars and traffic and steel and corn. Even if all cars aren't sold online right away, the way cars are designed, manufactured, built, and operated will depend on network logic and chip power.

The question "How big will online commerce be?" will have diminishing relevance, because all commerce is jumping onto the Internet. The distinctions between the Network Economy and the industrial economy will fade to the difference of animated versus inert. If money and information flow through something, then it's part of the Network Economy.

In the Network Economy, the net wins. All transactions and objects will tend to obey network logic.

11 The Law of Churn

Seek sustainable disequilibrium

In the industrial perspective, the economy was a machine that was to be tweaked to optimal efficiency, and, once finely tuned, maintained in productive harmony. Companies or industries especially productive of jobs or goods had to be protected and cherished at all costs, as if these firms were rare watches in a glass case.

As networks have permeated our world, the economy has come to resemble an ecology of organisms, interlinked and coevolving, constantly in flux, deeply tangled, ever expanding at its edges. As we know from recent ecological studies, no balance exists in nature; rather, as evolution proceeds, there is

perpetual disruption as new species displace old, as natural biomes shift in their makeup, and as organisms and environments transform each other. So it is with the network perspective: companies come and go quickly, careers are patchworks of vocations, industries are indefinite groupings of fluctuating firms.

Change is no stranger to the industrial economy or the embryonic information economy; Alvin Toffler coined the term future shock in 1970 as the sane response of humans to accelerating change. But the Network Economy has moved from change to churn.

Change, even in its toxic form, is rapid difference. Churn, on the other hand, is more like the Hindu god Shiva, a creative force of destruction and genesis. Churn topples the incumbent and creates a platform ideal for more innovation and birth. It is "compounded rebirth." And this genesis hovers on the edge of chaos.

Donald Hicks of the University of Texas studied the half-life of Texan businesses for the past 22 years and found that their longevity has dropped by half since 1970. That's change. But Austin, the city in Texas that has the shortest expected life spans for new businesses, also has the fastest-growing number of jobs and the highest wages. That's churn.

Hicks told his sponsors in Texas that "the vast majority of the employers and employment on which Texans will depend in the year 2026 - or even 2006 - do not yet exist." In order to produce 3 million new jobs by 2020, 15 million new jobs must be created in all, because of churn. "Rather than considering jobs as a fixed sum to be protected and augmented, Hicks argued, the state should focus on encouraging economic churning - on continually re-creating the state's economy," writes Jerry Useem in Inc., a small- business magazine that featured Hicks's report. Ironically, only by promoting churn can long-term stability be achieved.

This notion of constant churn is familiar to ecologists and those who manage large networks. The sustained vitality of a complex network requires that the net keep provoking itself out of balance. If the system settles into harmony and equilibrium, it will eventually stagnate and die.

Innovation is a disruption; constant innovation is perpetual disruption. This seems to be the goal of a well-made network: to sustain a perpetual disequilibrium. As economists (such as Paul Romer and Brian Arthur) begin to study the Network Economy, they see that it, too, operates by poising itself on the edge of constant chaos. In this chaotic churn is life-giving renewal and growth.

The difference between chaos and the edge of chaos is subtle. Apple Computer, in its attempt to seek persistent disequilibrium and stay innovative, may have leaned too far off-balance and unraveled toward extinction. Or, if its luck holds, after a near-death experience in devolution it may be burrowing toward a new mountain to climb.

The dark side of churn in the Network Economy is that the new economy builds on the constant extinction of individual companies as they're outpaced or morphed into yet newer companies in new fields. Industries and occupations also experience this churn. Even a sequence of rapid job changes for workers - let alone lifetime employment - is on its way out. Instead, careers - if that is the word for them - will increasingly resemble networks of multiple and simultaneous commitments with a constant churn of new skills and outmoded roles.

Networks are turbulent and uncertain. The prospect of constantly tearing down what is now working will make future shock seem tame. We, of course, will challenge the need to undo established successes, but we'll also find exhausting the constant, fierce birthing of so much that is new. The Network Economy is so primed to generate self-making newness that we may find this ceaseless tide of birth a type of violence.

Nonetheless, in the coming churn, the industrial age's titans will fall. In a poetic sense, the prime task of the Network Economy is to destroy - company by company, industry by industry - the industrial economy. While it undoes industry at its peak, it weaves a larger web of new, more agile, more tightly

linked organizations between its spaces.

Effective churning will be an art. In any case, promoting stability, defending productivity, and protecting success can only prolong the misery. When in doubt, churn. In the Network Economy, seek sustainable disequilibrium.

12 The Law of Inefficiencies

Don't solve problems

In the end, what does this Network Economy bring us?

Economists once thought that the coming age would bring supreme productivity. But, in a paradox, increasing technology has not led to measurable increases in productivity.

This is because productivity is exactly the wrong thing to care about. The only ones who should worry about productivity are robots. And, in fact, the one area of the economy that does show a rise in productivity has been the US and Japanese manufacturing sectors, which have seen about a 3 to 5 percent annual increase throughout the 1980s and into the 1990s. This is exactly where you want to find productivity. But we don't see productivity gains in the misnamed catch-all category, the service industry - and why would we? Is a Hollywood movie company that produces longer movies per dollar more productive than one that produces shorter movies?

The problem with trying to measure productivity is that it measures only how well people can do the wrong jobs. Any job that can be measured for productivity probably should be eliminated.

Peter Drucker has noted that in the industrial age, the task for each worker was to discover how to do his job better; that's productivity. But in the Network Economy, where machines do most of the inhumane work of manufacturing, the task for each worker is not "how to do this job right" but "what is the right job to do?" In the coming era, doing the exactly right next thing is far more "productive" than doing the same thing better. But how can one easily measure this vital sense of exploration and discovery? It will be invisible to productivity benchmarks.

Wasting time and being inefficient are the way to discovery. The Web is being run by 20-year-olds because they can afford to waste the 50 hours it takes to become proficient in exploring the Web. While 40-year-old boomers can't take a vacation without thinking how they'll justify the trip as being productive in some sense, the young can follow hunches and create seemingly mindless novelties on the Web without worrying about whether they are being efficient. Out of these inefficient tinkerings will come the future.

In the Network Economy, productivity is not our bottleneck. Our ability to solve our social and economic problems will be limited primarily by our lack of imagination in seizing opportunities, rather than trying to optimize solutions. In the words of Peter Drucker, as echoed recently by George Gilder, "Don't solve problems, seek opportunities." When you are solving problems, you are investing in your weaknesses; when you are seeking opportunities, you are banking on the network. The wonderful news about the Network Economy is that it plays right into human strengths. Repetition, sequels, copies, and automation all tend toward the free, while the innovative, original, and imaginative all soar in value.

Our minds will at first be bound by old rules of economic growth and productivity. Listening to the network can unloose them. In the Network Economy, don't solve problems, seek opportunities.

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