

Encyclopedia of the New Economy

So what is the new economy?

When we talk about the new economy, we're talking about a world in which people work with their brains instead of their hands. A world in which communications technology creates global competition - not just for running shoes and laptop computers, but also for bank loans and other services that can't be packed into a crate and shipped. A world in which innovation is more important than mass production. A world in which investment buys new concepts or the means to create them, rather than new machines. A world in which rapid change is a constant. A world at least as different from what came before it as the industrial age was from its agricultural predecessor. A world so different its emergence can only be described as a revolution.

Free markets are central to it. The Soviet Union's collapse settled the debate between market economies and planned ones. But simply to say that the new economy is about the unprecedented power of global markets to innovate, to create new wealth, and to distribute it more fairly is to miss the most interesting part of the story. Markets themselves are changing profoundly. To understand that, start by examining the mystery of Microsoft. The fact that Bill Gates is the world's richest man belies a huge shift in the values of capitalism. Microsoft has annual sales of US\$11 billion, and most of its assets walk in and out of the doors wearing T-shirts. Yet the stock market values the company at well over \$150 billion - far more than either IBM (sales \$76 billion, market cap \$100 billion) or General Motors (sales \$160 billion, market cap \$50 billion). Why? Because the rules of competition are changing to favor companies like Microsoft over paragons of the industrial age.

Microsoft's rise is a testimony to the power of ideas in the new economy. Working with information is very different from working with the steel and glass from which our grandparents built their wealth.

Information is easier to produce and harder to control than stuff you can drop on your foot. For a start, computers can copy it and ship it anywhere, almost instantly and almost for free. Production and distribution, the basis of industrial power, can increasingly be taken for granted. Innovation and marketing are all. So an information economy is more open - it doesn't take a production line to compete, just a good idea. But it's also more competitive. Information is easy not just to duplicate, but to replicate. Successful firms have to keep innovating to keep ahead of copycats nipping at their heels. The average size of companies shrinks. New products and knockoffs alike emerge in months rather than years, and market power is increasingly based on making sense of an overabundance of ideas rather than rationing scarce material goods. Each added connection to a network's pool of knowledge multiplies the value of the whole - one reason for Microsoft's astonishing growth. The result: new rules of competition, new sorts of organization, new challenges for management. Some zealots talk about a New Economy, capital *N*, capital *E*, all too easily caricatured as "there won't be inflation anymore, because of technological change." Alas, as Stanford economist Paul Romer has reminded us, "If a majority of the Fed's board of governors decided to have 20 percent inflation, they could have it in a year, possibly in months." Then there's the idea that recessions are things of the past. This comes up at the end of every expansion. What's true is that the shift to an information economy is redefining how we need to think about both good times and bad. We don't know how to measure this new economy, because the productivity of a decisionmaker is harder to grasp than the productivity of someone bolting together cars. We don't know how to manage its companies, because decisionmakers can't be told what to do. We don't know how to compete in it, because information seeps so easily that supermarkets now offer banking services and Amazon.com has infiltrated its virtual bookshelves into Web sites the world over. We don't know how to oversee it, or whether it ultimately needs oversight at all. A final thing we don't know is where - or how - the revolution will end. We are building it together, all of us, by the sum of our collective choices. To help inform the architects of this new world, we've assembled an Encyclopedia of the New Economy. Read on, pioneer.

Adhocracy *Organization without structure.*

Adhocracies have long been used by creative enterprises- film studios and ad agencies, for instance - to produce a steady flow of differentiated products. They are a mirror image of the well-defined bureaucracies that built most industrial organizations: Instead of a strict rule book, there exists an evolving collection of shared goals. Startup software companies are a classic example. Instead of fixed tasks and job descriptions, everyone does what needs to be done. Computer networks encourage adhocracy by enabling people to continuously share information and coordinate themselves informally.

Attention economy *A marketplace based on the idea that while information is essentially infinite, demand for it is limited by the waking hours in a human day.*

Attention economics has been around for at least as long as there have been commercial media, whose true products are not sitcoms (or magazines), but eyeballs for advertisers. Interactive media take this concept a step further: they allow attention - say, a Web site's traffic - to be bought, sold, or bartered and instantly shipped to their sites anywhere in the world. And the whole business can be scaled up to a billion people watching the Olympics or down to a custom-tailored audience of you.

Attention economics helps explain some of the Net's seeming commercial anomalies, including the explosive growth of high-visibility navigation sites like Yahoo and the proliferation of free (to the user) products and services. Another example is the skyrocketing value of bankable sports, film, and TV stars who can catch eyes amid the fray. In an ever more trafficked world, tools forgetting (and keeping) attention will be increasingly valuable.

AT&T, breakup of *The beginning of the end for oldfashioned telecom monopolies and the first step toward truly global data networks.*

In January 1984 an antitrust agreement negotiated by US federal judge Harold Greene forced what was then the world's largest company to spin off the seven Baby Bells and open the US long distance phone market to competition. Starting with MCI and Sprint, the result has been lower prices, better performance, and an explosion of new companies and services, which continues today with everything from digital cell phones and callback services to low-Earth-orbit satellites and upstart Internet based networks such as WorldCom and Qwest.

AT&T's breakup reflects a fundamental change in thinking about the nature of telecommunications.

Traditional copper-wire-based telcos were seen as "natural" monopolies, endowed with insurmountable economies of scale. But technological advances - from fiber-optic cable and computerized switching to such mundane matters as automated billing - have transformed telecom into a fluid, increasingly global market.

Since 1984 more than 40 state-owned telcos around the world have been privatized and opened to competition.

Sheer size still gives entrenched telecom giants formidable clout. But prices for voice and data transmission continue to plummet - a key to the new economy's growth.

Bailout, IMF *Financial life support for developing countries that overdose on free-flowing global capital.*

Since 1990 investors chasing double-digit annual returns have poured more than \$1.2 trillion into emerging-market economies. But unreformed local banking systems have often failed to keep pace, steering the new funds to political cronies and over hyped industrial projects.

Eventually, their currencies weaken, speculators attack, and loans collapse. Then the International Monetary Fund is called to provide emergency financing, most

recently the \$100 billion-plus in rescue packages extended to South Korea and other Asian "tigers" late last year.

The IMF, a staid central bankers' club headquartered in Washington, DC, worries about the risk to an increasingly global economy of allowing even a second rank economy like Thailand's or Malaysia's to collapse.

But critics say that bailouts are themselves part of the problem, providing a de facto safety net for the big international banks and encouraging more market distorting bad lending.

Bandwidth *A network's carrying capacity, rarely sufficient.*

The term bandwidth used to mean the size of the slice of the radio spectrum available for a transmission. Today it is mostly used to describe the rate at which information -measured in bits of data per second - can move between computers. As such, bandwidth determines a network's ability to deliver information goods and services. But that also makes it one of the new economy's key limiting factors - ask a Web surfer stuck with a 28.8-Kbpsmodem, or consider MTV pondering (in the near term, anyway) online music videos.

Fiber-optic cable - currently being laid as fast as backhoes can dig trenches - and the late arrival of TV's deep-pocketed cavalry are changing that. Pundit George Gilder has proposed a bandwidth corollary of Moore's Law: Backbone capacity will triple annually for the next quarter century. It could happen. Already, corporate Internet users are measuring their access in gigabits per second - sufficient to start realizing the trillion-dollar pipedream of TV and Internet convergence. Meanwhile, the \$2billion, Denver-based telco Qwest is building from scratch a new US network with a top capacity of 2terabits (2 trillion bits) per second - sufficient to transmit the entire contents of the Library of Congress cross country in 20 seconds.

The astonishing economies of fiber-optics have revived -more quietly, this time - a version of the nuclear-power industry's old slogan: bandwidth could someday be "too cheap to meter." But for homes in particular, despite talk of wireless solutions, there remains the "last mile" problem of pulling fiber to individual customers. And then there is a question that the old economy answered by forcing regulated phone monopolies to provide universal service: Should everyone go to bandwidth heaven together?

Brand *The commercial equivalent of reputation.*

Brands are guideposts for consumers wandering through the new economy's ever more bewildering blizzard of choices. Long associated with ho-hum consumer products, branding is an antidote to commoditized production and brutal price competition. Even for behind-the-scenes technology companies, the idea of so-called trust marks like "Intel Inside" may provide insurance against bolt-from-the-blue technological change (hello, IBM). Indeed, some management theorists argue that brands should be valued as an asset on corporate balance sheets - although none have yet been able to answer the all-important question of exactly how to place a value on this asset.

Big Bang *The birth of global financial markets.*

On 27 October 1986, the London Stock Exchange followed its New York counterpart and abolished fixed commissions on share trading, setting up a free-for-all.

What came to be called the Big Bang also abolished internal market restrictions and vacated its 100-year-oldtrading floor in favor of all-electronic operations.

Since then, deregulated trading has made markets more efficient, more fluid, and more popular around the world.

The value of international shares traded on the London Exchange now totals more than £1 trillion (US\$1.6 trillion)annually - a third again more than its turnover in British shares. Indeed, the growth of global financial trading has-been the most

spectacular result of disembodied electronic markets. The value of cross-border share and bond trading has grown more than 5,000-fold since 1980, and \$1.4 trillion worth of foreign exchange is traded through the world's computers each day. The result: a continuous global plebiscite - not just on each company's business prospects, but also on each government's economic management.

Big Mac Index *A streetwise indicator of the comparative value of major world currencies.*

Invented by the London-based magazine *The Economist*, the Big Mac Index uses an edible icon of globalization as a kind of new economy gold standard. Its basis is the price of the signature McDonald's hamburger, converted into US dollars. Because the fast-food giant's production methods and pricing policies are standardized worldwide, the operating assumption is that month-to-month price differences from country to country reflect local currencies getting out of whack with fundamental costs and economic efficiencies.

Union Bank of Switzerland does a purchasing-power version, comparing how long the average wage earner in various countries needs to work to earn enough money to buy a Big Mac. At the end of 1997, the longest time needed was just under two hours, in Caracas, Venezuela; the shortest, in Tokyo, was nine minutes.

Bionomics *Economies as ecosystems, not machines.*

Bionomics is a popular notion spanning a variety of new economy concepts, including evolutionary economics and complexity theory. Advanced by the Bionomics Institute, based in San Rafael, California, its core idea is that individuals, companies, and markets exist in a complex, adaptive web, in which technological advance is analogous to biological evolution.

Bloomberg *The icon of real-time financial information.*

Michael Bloomberg, a former top trader at what was then Salomon Brothers, launched his New York-based private company in 1981 - a proprietary electronic network featuring instantaneous data and complex analytics for markets around the world. Along with competing versions from Reuters and Dow Jones Telerate, Bloomberg's "box" - in its latest incarnation, a sleek pair of LCD screens leased by brokerage houses and banks for \$1,160 a month - has become both a vital tool for managing money and a crucial synapse in the global economy's central nervous system. Meanwhile, Bloomberg itself, still privately held, has grown into a \$1 billion-a-year media giant, with tentacles in television, radio, and the Web.

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Capital *Stored value that can be used to produce more value.*

In industrial economies, capital means machines or the money to buy them. Today the term just as often means knowledge, brands, intellectual property such as databases and software, or even vaguer notions like social capital - the trust that enables people to work together on a handshake rather than an expensively negotiated contract.

Electronic networks are fueling this process by increasing both the range of what

can usefully be defined as capital and the speed with which it can move. The more kinds of capital there are - and the faster it moves - the greater the number of people who can share in the wealth. There is another term for this: economic growth.

Capitalism *A global economic system rooted in free enterprise, private property, and open markets; the way we all do business now.*

The heart of capitalism is a feedback mechanism, profit, which rewards activities that people appreciate sufficiently to pay for. Communism and even socialism lacked that, or expressed it imperfectly. And as technologies have grown more complex, capitalism's unparalleled ability to give people what they want - to match supply with demand - has largely obliterated its centrally planned rivals in a roar of economic growth.

Instead of socialism versus capitalism, the great debates of the 21st century are likely to pit interpretations of capitalism against one another. Indeed, battle lines are already being drawn - over trade, intellectual property, and equal access to technology.

Chaos theory *Ways to extract signals from noise.*

No equations can predict the growth of an oak tree - or, in the classic example, whether a butterfly flapping its wings can cause a storm a month later and 10,000 miles away. But computers can simulate such phenomena nonetheless by starting from a few simple rules that describe a process and then applying them thousands or millions of times.

Researchers are using this insight - and powerful computers - to understand everything from foreign exchange markets to the movement of crowds. The models are not great at prediction. Even when the rules are understood, it's hard to capture all the factors that affect the evolution of the real world. But the understanding they create may support people's own instincts and judgments. Even if they cannot predict prices, for example, traders hope that a new breed of computer simulations may at least predict when markets are heading for a bout of volatility.

Churn *Customer disloyalty.*

Ever faster innovation means more possibilities for customers to decide they don't really like your product after all - or to realize that someone else has a cheaper, faster, or better version. And the new economy's evermore efficient markets make it less costly - in money, time, or both - for consumers to make the move.

AOL learned all about churn when it developed a busy signal problem late in 1996 and tens of thousands of expensively acquired customers bolted to less-popular rivals. Long distance phone services and credit card companies encourage defectors by spewing millions of pieces of junk mail - and, more recently, Internet banner ads - offering everything from reduced rates and frequent-flier miles to cash.

Internet retailing looks to be churn's next great frontier.

Ecommerce pioneers are responding with new ways to build customer loyalty - personalized service, for example. But aggregators like Yahoo and Excite make it pathetically easy to click from one e-shop to another - even as location, store layout, and other traditional tools for building competitive advantage vanish.

Commoditization *The process by which the complex and the difficult become simple and easy - so simple and easy that anybody can do them, and does.*

Commoditization is a natural outcome of competition and technological advance: people learn better ways to make things and how to do so cheaper and faster. Prices plunge and essential differences vanish - look at cheap PCs or mass-market consumer electronics.

The new economy puts commoditization into overdrive, speeding the flows of information, component parts, and finished products to the point where products can progress from idea to commodity seemingly overnight.

The only real antidotes are barriers to entry - say, a niche market too small to attract big competition. Or innovation sufficiently rapid to stay ahead of the pack. Or - if technology itself doesn't conspire to undermine it - an old-fashioned monopoly.

Community *Aggregated people.*

In the physical world, communities are typically groups of people - a town, for instance - held together despite their differences. Virtual communities are different: they're people held together by their similarities. The members of, say, a chat group about the TV show *Friends* are all interested in that subject and "talk" only about it. Rarely does anyone discover the things over which they differ.

But that same homogeneity gives virtual communities immense (though still mainly potential) economic clout.

They bring likely customers together in one place, cheaply and easily - not a bad definition of a market. And, for consumers, they provide free help and service, along with valuable purchasing, market research, and R&D advice.

One problem is that virtual communities aren't bound together very tightly - no one even knows you're leaving.

And there are too many other places to go if the one you're in starts unraveling.

Complexity theory *The study of how and why large systems behave in ways unexplainable by the sum of their parts.*

Free markets are probably the best example of complex adaptive systems, as they're known by researchers at places like New Mexico's Santa Fe Institute. Players pursue nothing more than their own gain and interests.

Yet the result - in theory - is the fairest possible distribution of goods and resources. Indeed, much of today's economics is the practical study of these properties - figuring out when we can trust markets to produce fairness and when we need government to intervene.

Complexity theory, which originated in the study of natural environments, also helps explain how feedback loops can cause systems to stall. Whether it's outdated telecom restrictions or billion-dollar food subsidies, it's as easy to create vicious cycles as virtuous ones. The good news is that by helping to recognize the myriad ways in which systems can unintentionally screw up, complexity theory provides new tools for fixing them -and creates new respect for the ways they can unintentionally succeed.

Convergence *Bits are bits.*

It's the quintessential new economy idea: translate everything, from *Seinfeld* to your kid's homework, into the digitized 1s and 0s of computer language, then make it all available anywhere in the world via the Net. Big dollars are already being wagered on the prospect of TV and PC convergence - the idea that the two most powerful devices of the late 20th century can be merged into a single seamless information system. (Oh, and throw in the telephone, too.) It is a mesmerizing vision with profound ramifications for the corporate media landscape of the not-too-distant future. Stay tuned.

Coopetition *Cooperation between competitors.*

Altruism doesn't have to be the opposite of self-interest.

Sometimes - when trying to create a new market or hedge the risks of an expensive innovation - it can be a way to get what you want.

Coopetition - alliance, in the case of no competitors - is especially common in the computer industry, where consumers want to know in advance that a broad range

of companies will support a given technology.

Companies cooperating helps such markets grow faster, without requiring prolonged periods to shake out competing technologies. It also helps focus scarce resources - though not necessarily on what is ultimately the best technology.

Coopetition often involves companies agreeing not to battle in one market even as they fight like dogs in others: witness the current "grand alliance" of Sun, IBM, Apple, and Netscape, which is supporting the open programming language Java to undermine Microsoft's market power. More commonly, companies will compete on actual products even as they cooperate on technical standards, sacrificing a degree of independence to increase the odds of success for the technology as a while. Look at the huge success of American Airlines in opening its Sabre reservation system to competing carriers.

Needless to say, coopetition makes antitrust authorities nervous. There is an old-fashioned word for competitors who agree not to compete - *cartel*, with its overtones of price fixing. Today's regulators appreciate the theoretical advantages of coopetition, but in practice they still want to be sure that they can distinguish it from old-fashioned collusion. And as Microsoft's on-again, off-again antitrust investigation shows, separating new ways of doing things right from old ways of doing things wrong is far from easy.

Cycle time *How long it takes to bring a new product to market or to upgrade an existing one.*

Prior to the industrial revolution, cycle times could often be measured in centuries. They've been declining ever since, pulled along by ever larger and ever hungrier markets and pushed by increasingly supple technology.

Detroit automakers could stretch a basic model changeover a decade; competition from the swifter Japanese changed that. Today exhausted Web developers talk about "Internet time," where the cycle time gets close to zero - essentially, nonstop continuous change and innovation.

Data mining *Extracting knowledge from information.*

The combination of fast computers, cheap storage, and better communication makes it easier by the day to tease useful information out of everything from supermarket buying patterns to credit histories. For clever marketeers, that knowledge can be worth as much as the stuff real miners dig from the ground.

More than 95 percent of US companies now use some form of data mining - often nothing more than mailing lists, but increasingly the more sophisticated psychographic profiles of potential customers that make privacy advocates shake. It's a perfect hot-button political issue: Whose data is it, anyway?

Decentralization *Decision making moved from the center of an organization to the edges.*

What do you expect when companies give every employee a computer, a telephone, and an Internet connection? Decentralization is an inevitable consequence of an information economy, where communications and processing power are cheap, time is short, and enterprises span the globe. And that means empowering decision makers down to the lowest level.

Managers count on those same information networks to help them keep an eye on what workers are up to (including who's wasting time playing *Quake*). But decentralized managers also face a novel question: To what extent can they still consider themselves to be in charge?

Deflation *Falling prices.*

Some otherwise reasonable people worry that the evermore efficient new economy will bury us in an avalanche of goods - a global glut. Their fear is a replay of the 1930s: tumbling prices, vaporized profits, supply running far ahead of

demand.

Deflation is indeed happening in a few markets - look at the price of computer chips or long distance phone calls.

But the price of many other things is definitely not falling (Silicon Valley real estate, for starters). The price of the average car is stable or even rising - though what you get is a vastly superior product.

What technology undeniably has done is raise the speed of innovation in the economy. That means certain industries will suddenly find themselves faced with falling prices and slumping demand - not because the whole economy is going into a deflation-induced slump, but simply because somebody else has come up with products and services that people would prefer to buy.

It's unhappy for anyone on the downside of an innovation cycle. But far from crippling the economy, that sort of change is precisely what produces continued innovation and growth.

Deregulation *What happens when governments have to compete for capital and labor.*

Opening up telecom to competition helped kick-start the new economy. And as the resulting economies become ever more fluid, government intervention in economic processes - or the lack of it - is becoming simply another factor of production. In Walter Winston's famous phrase, "Money goes where it is wanted and stays where it is well treated." So, bureaucrats be warned: Regulate at your peril.

Digital signatures *The lifeblood of electronic commerce and citizenship.*

Digital signatures - John Hancocks for electronic documents - are a key tool in making cyberspace a place where people can do things besides hunt down information. Like their pen-and-ink counterparts, they establish identity and so can also be used to establish legal responsibility. Unlike real-world signatures, they can also establish the complete authenticity of whatever they are affixed to - in effect, creating a tamper-proof seal.

Governments from Germany to Utah have given digital signatures at least the same legal status as the paper kind. But electronic autographs have also become embroiled in the general cryptography debate. Security services don't want people - criminals, to be specific - using strong crypto. Unfortunately, the same technology is also needed to create forgery-proof signatures. And so far - at least in the United States - the police aren't giving ground.

Discontinuity *Change so all-encompassing that it transforms even the standards by which change is measured.*

Discontinuities are bolts from the blue - most often technological, but sometimes social or political (wars, for instance). Sudden shifts in the competitive landscape are not unique to the new economy - ask your local horse and-buggy salesman. But accelerating innovation makes them more frequent - and, for those in the corporate trenches, sometimes more dramatic.

The challenge for companies is to adapt - many don't. In a famous example, US railroads failed to realize that their real business was something bigger - transportation.

They got trashed by the introduction of long distance trucking. A more recent example: Microsoft's (near)dismissal of a technological flash in the pan called the Internet.

Diseconomies of scale *Too many cooks spoil the broth.*

In information work, being big and muscle bound often means rising production costs and falling productivity.

Fred Brooks, now a professor at the University of North Carolina at Chapel Hill, first documented the phenomenon when he analyzed the development disaster that

became IBM's breakthrough operating system, OS/360. Brooks, who was in charge of the project, found that the more people he put on the project, the more it lagged behind schedule. With hindsight he realized that trying to bring the newcomers up to speed took more time and effort than they could contribute to the project - not to mention exacerbating the confusion caused by ever-lengthening chains of communication.

Bill Gates has read Brooks' book, *The Mythical Man-Month*. That's why Microsoft, for all the billions of dollars in its war chest, keeps its development teams small.

Disintermediation *Cutting out the middleman.*

As networks connect everybody to everybody else, they increase the opportunities for shortcuts. When you can connect straight from your desktop to the computer of your broker or bank, stockbrokers and bank tellers start to look like overpriced terminal devices.

Disintermediation first gained momentum in financial markets when customers began forsaking savings banks for their stockbrokers' money market accounts - denying banks the opportunity to make a nice return by investing the funds in money markets themselves. Now entire swaths of the economy are vulnerable: stockbrokers, real-estate agents, anybody who picks up a phone for a living.

And maybe generic clothing stores, computer resellers, and record shops, too - thanks in part to the cheap, convenient, and increasingly universal distribution networks otherwise known as FedEx and UPS.

In practice, though, disintermediation more often means changing jobs, not eliminating them. And, in the process, it can create opportunities for new and different middlemen - look at online bookseller Amazon.com and stealth retailers like CUC International. As networks turn increasingly mass-market, everyone involved in sales is playing a duck-and-weave game of disintermediation and reintermediation. To the winner go the customer relationships.

Distributed systems *Cooperation by another name.*

Distributed systems originated in the computer industry, where - to the surprise of many - collections of medium powered computers sharing work often outperformed even high-powered monolithic mainframes. Like decentralization, distributed systems work by putting decision making where the information is, shortening chains of command and speeding response. In doing so, they are particularly well suited to very large applications - the Internet, for instance, whose 91 million computers make it by far the largest distributed system ever created.

Ecash *The future of money, or at least of small change.*

Disembodied cash - encrypted electronic data redeemable for real money - is the new economy's answer to coins and bills. Carried on a microchip equipped smartcard or squirted remotely across the Net, it is cheerful, anonymous, and cheap to administer.

A variety of proprietary technologies - Mondex, ecash, CyberCash, Proton, and MilliCent, among others - are battling for a share of the global consumer payments market, worth an astonishing US\$7 trillion annually.

Many of the schemes originate in Europe, where centralized banking systems and smaller national markets raise fewer barriers to entry than in the sprawling United States.

For larger purchases, ecash schemes must battle not only with each other, but also with credit and debit cards.

But for small purchases digital cash has overwhelming advantages - starting with transaction costs as low as a fraction of a cent. And with smartcards, you always have the right change for the phone booth or parking meter - if it takes smartcards, that is.

Ecommerce *Doing business on the network.*

More and more companies are making the Web their storefront. It's cheap, global, and quick, with no margin sapping middlemen. That's why forecasters predict that online retail transactions will explode, reaching \$10 billion annually by 2000. And retail sales are merely part of the picture. While only a minority of Net users - let alone the public at large - have made a purchase online (security is still a big fear), the vast majority have used it to research which products to buy offline.

The mail-order catalog industry is one obvious target.

Online retailers don't face the costs of printing or mailing paper, nor do they pay people to wait by the phones for orders to come in. The hottest markets for consumer sales are computer equipment (Dell racks up \$3 million in software and hardware sales on the Web daily), books, music, travel, and finance.

The current champ e-seller is router maker Cisco, whose online revenues are hitting \$9 million a day. Customers like the convenience of buying and configuring products online. Aircraft builder Boeing is taking a different tack: Suppliers of parts for its new 777 are required to adopt the company's electronic-design standards so that partners can work together more closely. And Japan's is trying to broaden its base of suppliers by posting its requirements online - in English as well as Japanese - and inviting bids from all comers.

Economies of time *Faster is better.*

Being first to market brings huge advantage in an information economy. By learning your way of doing things, customers make a mental investment in your product - a powerful hold in an otherwise mostly fiction free world.

More generally, markets based on weightless bits moving at the speed of light tend to reward quality rather than mere quantity. As physicist Freeman Dyson has observed, "Never sacrifice economies of time for economies of size." Which is why even Microsoft worries about cycle time.

Education *The ability to train yourself.*

Training - acquiring the skills necessary to do a specific job - is the most important form of investment in an information economy. Education allows people to manage their own ability to acquire and use knowledge - and, thus, to manage their own careers and lives.

More and more people are grasping that opportunity.

Today nearly half of all US college students are over age 25, returning to school to increase their knowledge. Many mature students are financed by their employers. More still are investing in themselves, which is a double-edged sword for bosses: Better-educated employees are good for business, but they also transform bosses from employers into clients.

Electronic markets *Faster and cheaper is better.*

A decade ago, MIT's Tom Malone pointed out that information technology would shrink companies by promoting market-based trading. Firms would do less internally, focusing on the few areas in which they excel, and more externally, using electronic markets. Malone's predictions have borne out: Markets are growing and firms are shrinking, in both absolute and relative terms.

New markets are springing up for intangible goods such as bandwidth and pollution rights. And old ones for computer and auto components are expanding, as companies outsource more of the ingredients that make up their finished products.

Increasingly, the issue is how to reinvent the whole idea of markets. What information - or how much of it - should market technology provide? Physicality can still be hugely important: A place at the top of the steps of the Chicago Board of Trade's trading pit changed hands last year for nearly \$1 million. Indeed, one reason Chicago's electronic rivals haven't taken off is that they haven't managed to

find ways to convey as much information as a crowd of milling, shouting traders - not yet anyway.

Emissions trading *Putting a price on pollution.*

The idea is simple enough: Regulatory agencies - local, national, maybe even international someday - issue pollution rights, entitling the bearer to emit a set amount of smoke, noxious gas, or chemical effluents. Companies that choose to pollute may purchase the right to do so, either on the open market or from a company that has cutback. Overall pollution levels fall, because the government issues a fixed - and, typically, declining - number of rights. And the economy stays healthy, because managers can judge for themselves whether the price of polluting - set now by an open market - is worth paying.

US emissions trading schemes - notably for sulfur dioxide, the chief cause of acid rain - are already doing business worth more than \$1 billion annually.

Participants at the 1997 global environmental summit in Kyoto agreed to make emissions trading part of any worldwide effort to cut greenhouse gases. Another suggestion: credits for companies that make extra efforts to clean up the environment - planting trees that soak up carbon dioxide, for one.

Encryption *The source of electronic trust.*

Spies, diplomats, and soldiers like codes, because ciphers can hide messages from prying eyes. But inserted into electronic files, codes can also be used to create distinct and reliable digital signatures - far more reliable than the paper-and-ink kind. Ecommerce's future depends on it.

Public key encryption, the main type in use today, provides the two key-security functions needed to make networked transactions work: a digital signature, proving an electronic trader's identity and legally binding him or her to a deal, and a suitably opaque cloak of confidentiality, behind which commercially sensitive - or just plain private - information can be hidden. As a bonus, it accomplishes these feats at virtually no cost and it requires relatively little technical derring-do.

Despite all that, some governments - notably the United States - are seeking to restrict all but the weakest forms of encryption, even as they claim to promote ecommerce.

The pretext is that criminals and terrorists will use it to hide their evil doings. But strong encryption software is already freely available throughout the world (there are dozens of competing products) and is an essential part of the trillion-dollar-a-day global financial system. Money doesn't take unnecessary risks.

ERM, 1992 crisis of *Markets trump governments.*

For much of the 20th century, currency exchange rates were pretty much whatever governments decided they should be. But in 1992 the UK tried to support both a strong pound (to meet agreed-upon exchange-rate targets) and lower interest rates (to boost domestic output). The markets would have none of it. Central bankers spent billions trying to maintain the pound's place in the official European Exchange Rate Mechanism(ERM) - most of it going straight into the pockets of George Soros and other speculators. After a few weeks fraught with tension, the pound was cut loose and floated free - ending once and for all the illusion that national governments control the flow of money in a global economy.

Hope springs eternal: In the early days of the current Asian financial crisis, Malaysian prime minister Mahathir bin Mohamad complained loudly that Soros and his speculator friends were conspiring against him. The markets shrugged, hammered the overvalued ringgit down a few more notches, and waited for the message to sink in.

Feedback, positive *Success that breeds success.*

Positive feedback - growth that accelerates itself - annoys economists. They like to

believe that every economic force has a counterforce, so that nothing grows without bounds and markets always balance competing interests.

Positive-feedback loops create a winner-take-all world: whoever or whatever starts ahead gets further and further ahead. The classic examples are utilities such as gas and water companies - deemed natural monopolies, because their economies of scale grow without bound.

Incumbents literally own their markets.

Digital technology gives this a new twist. Being first is not quite the guarantee it once was: look at WordStar, CP/M, and VisiCalc. But once a positive-feedback loop does kick in, the result can be awesome concentrations of economic power. Bill Gates once explained it this way, talking about Windows: "Momentum creates momentum.

If you have volume, then people write apps. If people write apps, you have momentum." And if it goes on long enough, you have \$40 billion.

Friction-free *What markets want to be.*

One of the obvious effects of information technology is to make transactions of all kinds smoother. Indeed, the hefty profit to be wrung from eliminating high transportation costs, poor communications, and parasitic intermediaries are a driving force behind the whole new economy.

Friction-free economics means empowered consumers, accelerated market development, and shorter life spans for products and jobs. No one's roped into anything anymore. Efficiency rises, costs fall, and basic rules are rewritten - hyper competition prevails, and the victors win by adapting quickest to change. Here lies an interesting dilemma: When it's harder and harder to keep a grip, how do you sustain competitive advantage?

Game theory *The science of winning.*

Traditional economics concentrates on ascertaining how markets reach equilibrium; game theory looks at the strategies players can use to win, making it ideal for the complex interactions of a networked economy.

Originally developed as a branch of mathematics by Johnson Neumann and Oskar Morgenstern in the 1940s, game theory reduces complex interactions to simplified grids showing the likely payoffs or liabilities from any given move. In 1994 economists John Harsanyi, John Nash, and Reinhard Selten won a Nobel Prize for building workable economic tools from von Neumann's insights.

The classic use is to analyze how a company and its competitors might react to a given new strategy or set of events. The challenge, in an ever more complex networked economy, is to figure out what all those factors and players might be.

Geography *Where you are still matters.*

Electronic networks enable everybody to communicate with anybody anytime they want. That doesn't mean we all do, or ever will. Robert Kraut of Bell Communications Research studied patterns of communication and collaboration among globetrotting scientists. When it came to actual research, they almost never worked with anybody who wasn't on the same floor in the same building. Good research, he hypothesized, came from shared confusion - bumping into somebody and rambling on about whatever is on your mind at the time.

By the same token, there are conversations that you have with someone you see every day that you'd never think of having with somebody accessible only via email. And some of the most digital people in the world complain they spend too much of their lives in meetings - or getting to and from them. All of which explains why, even in a global cyber economy, places such as Silicon Valley -not to mention New York and London - will remain preeminent.

Globalization *Bye-bye borders.*

Retired Citicorp chair Walter Wriston puts it bluntly: "There is no place to hide." With a relentlessness that is astonishing even hardcore globalists, worldwide markets and standards are rapidly emerging in finance, marketing, communications, and transportation.

Advocates say the results will boost trade, productivity, and living standards worldwide. Critics say the price will include even greater inequities of wealth, vicious wage competition, and financial crises. Either way, one thing is certain: The process has only just begun.

Is *globalization*, as skeptical Europeans will loudly tell you, just a euphemism for *Americanization*? Ironically, maybe not, historian Francis Fukuyama argues, because its most sweeping victories are coming just as classic red-white-and-blue America fades into a multicultural dawn. We're all just modern now. Pass the ketchup.

Grossman's paradox *Why there will always be a market for information.*

Assume, as many economists do, that markets know all available information, can perfectly deduce its consequences, and react as soon as possible to each fresh piece of news. Wharton's Sanford Grossman was the first to point out that this assumption is self-contradictory.

If markets are perfectly informed, then there is nothing to be gained from gathering more information. But if nobody gathers information, then markets will not be perfectly informed. Conclusion: We can never know it all - or at least we can never know that we know it all.

Growth theory, new *Knowledge creates economic growth, which spurs knowledge, which begets growth.*

Traditional economists view growth as a product of people and objects: An increasing population boosts growth by providing more labor; an expanding machinery base makes labor more efficient. New growth theory, built on work done in the 1950s by Nobel laureate Robert Solow and currently championed by Stanford University's Paul Romer, points out that knowledge - particularly of technology - is crucial to the process.

Though it might seem obvious, this insight turns a generation of economic theory on its head.

A classic example is India's automobile industry. Tariff walls long protected it, on the theory that high prices would be plowed back into investment, fueling more growth. Nothing of the sort happened. India still produces bad copies of 1950s and '60s British cars on outdated machinery. When the country cut itself off from world markets, it also cut itself off from ideas. The very policies meant to create growth stymied it.

In the absence of such self-defeating policies, new growth theory (dubbed "new" to differentiate it from its more traditional antecedents) is essentially optimistic: Knowledge builds on itself, doubly so when boosted by information technology. So, instead of limits from scarce resources, knowledge-based economies can look forward to increasingly rapid progress driven by the growing abundance of ideas. If politicians don't mess it up, that is.

Hayek, Friedrich von *Free-market seer.*

An Austrian-born British economist, Hayek (1889-1992) preceded Milton Friedman as the modern prophet of free markets. His best-known idea: Planned economies can't succeed, because over the long run even the most enlightened bureaucrats aren't smart enough to make them work - and never will be. Japan, take note.

Hayek's 1944 *The Road to Serfdom* became a revered part of the Cold War anticommunist canon. But he won the 1974 Nobel Prize in economics for a more specific insight: Government intervention in free markets merely forestalls problems such as inflation, unemployment, and recession. The heart of the

problem is that people are smart enough to anticipate and undermine government actions - say, a change in interest rates. So government ultimately can't fix economic problems; it can only hope to convince people to fix them for themselves.

Increasing returns *Those that have, get.*

Most markets are characterized by diminishing returns: To manufacture more, raw materials have to be brought from further and further away, until at some point it literally isn't worth the effort. Competitors slug it out around the margins. Increasing returns - typical of information-based industries, including software - work the opposite way: Companies develop a product once, then sell it over and over at ever higher margins. The frequent result: markets dominated by a single company. Increasing returns are also common in complex natural environments - successful species dominate. Brian Arthur, an economist at New Mexico's Santa Fe Institute who has made his career exploring the consequences, reckons that information's ever larger share in modern economies will put increasing returns more and more at center stage - and upend everything from traditional business culture to antitrust policy.

Information food chain *Data, information, knowledge.*

All bits are not created equal. Some carry useful data, others are random marks on a page, garbage on a disk.

Digested by the human mind, data becomes information - messages that change the way we think about the world.

Knowledge is a step further: mental tools that make sense of things, an evolving set of beliefs about the world.

Once the world's information truly is at everybody's fingertips, the only thing that will distinguish the rich and powerful from the merely struggling is what's in their heads - the knowledge of what information to call for and how to put it to work. Knowledge is what makes mere information valuable. Which is why management guru Peter Drucker famously calls it "the only meaningful resource today.

Information technology *Tools for creating, sorting, storing, and moving data.*

Computers, the software that runs on them, and the networks that connect them are the key enabling technologies of the new economy. IT is now the single biggest part of the US economy, about 11 percent of the GDP. But high-tech growth alone is not what the new economy is about. On the contrary, it's the use - not merely the making - of new tools that's important.

Successful new technologies typically begin as hobbies or enthusiasms, then slowly become substitutes for older technologies. (Remember the horseless carriage?) Eventually, they transform whole industries and markets.

And finally, they are taken for granted, part of the landscape.

In the 1950s and 1960s, when the car was king, many experts concluded that the whole economy would soon be run like big Detroit car companies. Predictions that the future will be run like Microsoft are likely to prove equally wrong. Only when we start to take technologies for granted will their real impact be felt. And for computers, that still remains a long way off.

Information theory *How to measure meaning.*

Fifty years ago Claude Shannon, a Bell Labs engineer, published a monograph with the first modern definition of information: a message that reduces uncertainty. And he added that the amount of information carried by any message can be quantified by looking at the extent to which it reduces uncertainty.

Shannon's work has had more impact on telecom engineering than on corporate strategy. But it is also a useful reminder: Information is made up of messages, however trivial, that change our beliefs about the world.

Innovation *The only source of sustainable growth.*

Constant innovation has long been recognized as vital to healthy economies, somewhat less so for individual companies, whose success has often depended on making one great innovation and then milking it.

The rapid spread of information technology has shifted the nature of competitive advantage. Owning a vault full of patents or a high-efficiency production line is no guarantee of anything. Some firms, as MIT's Eric von Hippel points out, get their new ideas from their customers; others look to their suppliers for the lead.

Either way, the key is to "own" a problem that needs solving - to have an understanding of the world or a relationship with customers. To keep up, you need the right answers; to get ahead, you need the right questions.

Intangible assets *Things of value you can't drop on your foot.*

Intangible assets are one of the great puzzles of the new economy. In most industries, brands, research, expertise, and the knowledge of how to do things make up an increasing share of a company's value. But they typically are missing from the audited figures that supposedly show how much a company is worth.

Stock-market bulls say that this paradox explains today's high valuations: Markets are valuing assets that conventional accounting does not capture. Perhaps.

Certainly information has become more valuable in the new economy, and information is at the core of most intangible assets. The problem is deciding precisely how knowledge-based assets could or should be valued. Is advertising an investment in building a brand asset or just another cost of doing business? Should software development be counted as an investment or, as most companies do today, as an expense? Decades-old tax codes drive most of the answers. Time for a change.

Intellectual capital *The sum of what you know.*

The most valuable part of any company is what walks in and out of its doors every day. The working knowledge that people carry in their heads - knowledge of products, customers, how to work together, and so on - are a company's intellectual capital.

Purists will argue about whether it should strictly be called capital. People, after all, cannot be bought and sold like most traditional forms of capital. But the bottom line is that having the right team is more crucial than ever. And now that expertise can be translated directly into investment cash, it is a lot more like old-fashioned capital than purists may realize.

Intellectual property *Legally protected ideas.*

Intellectual property - patents, copyrights, and trademarks - is an intangible asset that can be bought and sold. The laws that govern it try to balance competing interests: innovators, who typically want more control over their ideas and to profit from them, and everybody else, who typically want looser controls, so that other innovators can use them to move things even further ahead. The result is a set of deliberately leaky laws.

Digital technology's easy creativity has set off a vigorous debate. Some key intellectual-property players - notably, Hollywood movie studios - say that the laws should be tightened to compensate for the Net's loose environment.

Opponents say the laws should, if anything, be eased to prevent existing owners from profiteering as the Net multiplies their markets.

Another hot issue is databases. US law generally doesn't protect collections of facts: Companies can - and do - strip information from telephone books and other freely available sources, then sell the reconfigured results as they like. The original owners argue that they would produce even more if they could get more - airtight rights. But most suggestions on how to offer greater protection would put a damper on everything from scientific research to sports reporting (because teams or

leagues might assert ownership over players' stats).

Some digital enthusiasts argue that the very term intellectual property is an oxymoron. They are probably right. But that doesn't make the laws governing it any less important - or any easier to write.

Just-in-time learning *Knowledge at your fingertips.*

Just-in-time education does for knowledge what just-in time delivery does for manufacturing: It delivers the right tools and parts when people need them. Instead of spending months in boring classrooms, people can use networks and clever databases to answer questions and solve problems as they crop up.

Efficiency isn't the only issue: Technology's breakneck pace makes it ever harder for training to keep up. Just-in time education means constantly upgrading your workforce's knowledge base, supplementing - or even replacing - traditional technical schools and four-year colleges. Not as much fun as dorm life, though.

Knowledge management *Husbandry for ideas.*

If knowledge is the only real asset, why not manage it like any other? That thought has spawned a mini-industry, from purportedly knowledge-capturing software to corporate "chief knowledge officers" responsible for making their companies smarter. A lot of these efforts are misguided.

The problem is that knowledge isn't like other inventory -it can't just sit in the warehouse until needed, then be dusted off and used. It has to be kept fresh, relevant, and alive. It has to be exercised through continual discussion and revision. And it cannot be managed separately from the people in whose heads it resides. That's the reason companies that successfully manage their knowledge focus on putting people in touch not with vast databases, but with other people. Typically, this means putting questions on an equal footing with answers, because it forces those with knowledge to reshape it continually, to fit their colleagues' needs. In the process they continually renew their knowledge and avoid seeing it depreciate into irrelevance.

Knowledge worker *Someone paid to think.*

At the beginning of this century two-thirds of working US citizens earned their livings by making things; today two thirds earn theirs by making decisions. This change has brought prosperity and standards of living our grandparents could only dream of. But it has also made the world a less certain place: A knowledge worker, today's bosses say only half in jest, is someone who can never quite manage to define their own job.

Decision makers are harder to manage than manual workers - telling them what and how to decide defeats the purpose. Worse, the best decision makers know things their bosses don't - one reason being in charge just isn't what it used to be.

Lock-in *The high cost of switching technological horses.*

Hardware and software are the least of what companies invest in information technology. The really important investments are data and the time and effort spent learning how to use new systems. Protecting those investments explains why many companies stick with obsolete, inefficient computer systems. The cost of converting to new technologies and retraining workers outweighs the benefits - or seems to. That extra cost, multiplied by thousands of companies and millions of users, is called lock-in. Or Windows 98.

Lock-in can happen with many kinds of standardized products - railroad gauges and VHS video are classic examples. Information technology is especially vulnerable because it typically involves integrated systems, in which it is hard to change only a few things.

Big hardware and software firms tend to like lock-in: It keeps competitors at bay. But in order to keep customers locked in, companies have to waste time and effort

tending old technologies, even the best of which eventually run out of steam.

Markets, free *Collective intelligence.*

If human beings were omniscient, most markets would make no sense. After all, there's no reason to trade stocks if everyone knows the true value of every company. But people are not omniscient. And markets are the best way yet devised to overcome human limitations in deciding what to build, buy, or sell. Markets are democratic, sort of. And they leave individuals free to make their own choices. Markets are not perfect, but the alternatives are more imperfect.

Mass customization *The market of you.*

The Industrial Age created a dilemma. Goods could be mass produced, standardized, and cheap. Or they could be individually made, unique, and expensive. The information age - and the advent of computer-controlled machine tools - lets consumers have it both ways: customized and cheap, automated and personal. So the question isn't whether people can choose - it's whether they'll want to.

Off-the-rack suits and off-the-showroom -floor cars relieve you of having to think in too much detail about what you want. Custom -fit Levis? Fair enough. Custom configured computers? OK. But for most people, utter freedom of choice can lose its appeal pretty quickly, no matter how low the price. Custom -created audio CDs, to take one current fad, make sense only if you already know, song by song, exactly what you like.

Still, mass customization will feed what has been termed the deindustrialization of consumer-driven economics: increasing status for things that can't be supplied on a large-scale basis, period. Montana ranches, Ming vases, and massages, for starters.

Microfinance *Walking before you run.*

Traditional aid to developing countries focuses on big projects - dams, power stations, factories - that often do remarkably little for the people they're supposed to help.

Microfinance programs change that by investing at the grassroots, lending tiny amounts - often \$50 or less - to eager proto entrepreneurs.

Pioneered by outfits like Bangladesh's Grameen Bank, microfinance schemes eschew bloated bureaucracies, supporting their members with local self-help groups.

The key to their success is information: On-the-ground knowledge of who is a good credit risk and of what microenterprises - typically things like handcrafts and small trading - stand the best chance of success.

Decentralized, adaptive, and based on local knowledge, microfinance is the vanguard for fast-track change in the developing world.

Microprocessor *Distributable intelligence.*

When a team of four Intel engineers first put all the components of a computer on a small silicon chip in 1971, giant mainframes ruled the information world.

Nobody had a clue what to do with their tiny cousins.

Today mainframes are a minor subspecies, and there are four times as many microprocessors as people on the planet.

An ever greater number of those little brains are devoted to dumb tasks like running CD players or monitoring your car's timing. But the really interesting thing is what happens when they start getting linked together through the Net and operating and monitoring everything from roadside traffic -flow systems to electric-power lines. The value of a network increases as the square of the number of linked devices. What's 20 billion squared?

Microsoft *800-pound gorilla.*

The lord of lock-in, Microsoft supplied the operating system on 90 percent of the 91 million personal computers sold in the world last year.

Bill Gates has a classic new economy skill: seizing opportunities. In 1980, when IBM needed software for its revolutionary new personal computer, Gates hustled out and bought DOS from Tim Patterson, another Seattle programmer. Even after he won the IBM contract, Gates, for years, never believed that an OS could be as valuable as programming languages. Fortunately for him, he was wrong.

Now he plays the new economy like a \$11 billion -a-year violin, with millions of locked-in customers - most of them quite content to be so. Network externalities ensure that the more people buy Microsoft products, the more valuable those products become - both for those buying them and for those who already own them. Microsoft now looks invulnerable. Almost as invulnerable as IBM looked when Microsoft toppled it from the geek throne.

Millennium bug *Unplanned obsolescence.*

Back in the early days of computing - that is, about 20 years ago - memory was expensive. So programmers thought they'd save a byte or two by using only the last two digits of the year in calculating dates. No one imagined that the programs would still be in use when 99 rolled over to 00. Or that the problem they were creating - dubbed Y2K, for year 2000 - would be the stuff of magazine covers two decades later.

Will phones stop ringing and planes fall out of the sky at 12:01 a.m. on January 1, 2000? No one knows. No one can guarantee that there won't be problems. In an evermore networked world, one overlooked line of old date code in the wrong place could, in theory, kick off cascading troubles. In that possibility lie both waking nightmares for corporate IS managers and a boom worth tens of billions of dollars a year to eager Y2K consultants.

Mindshare *When everybody knows your name.*

Growing talk about mindshare instead of market share is another small example of technology's ability to turn traditional relationships between supply and demand on their heads. Market share's focus is what people are producing and selling today; mindshare measures what people are talking about for tomorrow. It's brand awareness - and then some. And in ever faster -moving markets, being talked about can be a competitive advantage as strong as a top-flight production line - if not stronger.

Monopolies *Too much of a good thing.*

Technology is turning the tables on monopolies.

Traditionally, monopolies have been about tangible assets. John D. Rockefeller, for example, dominated the oil industry by buying up pipelines. Information technology can route around such obstacles, introducing competition into onetime natural monopolies like electric power and long -distance phone service. But the process creates new kinds of commercial hegemony based on control of what can loosely be called ideas.

Patents and copyrights are monopolies on ideas -temporary at best and often leaky. The newer sort stem from the daunting commercial power of the new economy's most powerful engines: standard setting -another term for lock-in - and increasing returns.

The result is a wilderness for would -be regulators. If Microsoft dominates PC operating systems, is that good for consumers because it creates compatibility? Or bad because it quashes competition? How far should Microsoft be able to extend that dominance by incorporating other technologies - Internet browsers, for example? And should the same rules also apply to Intel incorporating new features into its microprocessors? Quite simply, no one knows. But if markets are indeed to

rule, governments - or someone - need to come up with smart answers.

Moore's Law *High tech's tidal force.*

In a 1965 speech, Intel chair (now emeritus) Gordon Moore made a famous observation: With price kept constant, the processing power of microchips doubles every 18 months. Moore's Law, as it came to be known, governs Silicon Valley's most important product cycles, for hardware and software alike. And its relentless drive has spawned whole new industries: digital watches, calculators, videogames, the Internet - with smart phones, digital TV, and who knows what else on the horizon.

How long will Moore's Law hold up? Or put another way, when will its hockey-stick growth curve droop into amore mundane S? Twenty years is the usual guess, which is another way of saying no one knows.

Narrowcasting *More signal, less noise.*

Electronic media let you pick your weapon. Broadcast is for brand building in mass markets. Interactivity ferrets out individuals. And between them lies narrowcasting, the perfect tool for mining niche markets.

Narrow casting's pioneer days were on cable television, but its true home will be the long-anticipated convergence of TV and the Net. Web-based streaming -media technologies already make possible live telecasts to audiences as large as 50,000 people at a cost per viewer lower than cable. When you're paying to reach people, it pays to reach only the ones you really want.

Netheads versus Bellheads *The great telecom divide.*

Anything the phone system can do, the Internet can do better, and cheaper - or soon will. The International Telecommunication Union, a Geneva-based Bellhead redoubt, admits that transmitting data over traditional phone networks already costs four times more than sending it by Internet packet switching. That difference is widening. And some of those cheap data packets are already carrying digitized voices, taking bites out of the telcos core business. No wonder even AT&T and Deutsche Telekom are investing in Internet telephony.

But more is at stake. Netheads and Bellheads have fundamentally different styles of business. Bellheads "serve" customers; Netheads want to enable customers to serve themselves. Traffic on the Net is doubling every six months; voice traffic is growing at less than 10percent each year. The only real question is why the Bellheads don't get smarter faster. One answer: massive sunk costs.

Netscape *The new economy's corporate poster child.*

Founded in 1994 to capitalize on an interesting US government-funded project called the Internet, Netscape proves that even Wall Street can understand new economy concepts like increasing returns. Eight months after Netscape Navigator 1.0 officially shipped, investors were pouring millions into a company that gave away its main product. The then-novel idea: to establish both a brand and a must-have platform.

For its pains, the Mountain View, California-based company quickly gained most of the browser market, a substantial - and paying - server business, and a default homepage that is one of the most heavily trafficked sites on the Web. But it also quickly got a face full of Microsoft, matching it free browser for free browser, and then some - at least until the Justice Department stepped in.

Under siege - not least from Wall Street - Netscape responded earlier this year with another leap of new economy faith, announcing that it will publish the source code to Navigator 5.0 - what would ordinarily be a key proprietary secret. The idea is to make Navigator an "open" standard for browsers - and thereby enlist software developers around the world to help build a better one than Microsoft's. So Netscape's future will literally be built by its customers. Or will if it can figure out

how to make enough money to survive as a standalone company.

Network externalities *Connections count.*

Fax machines and board games share an economic quirk: each new one sold - or, in the case of games, each new enthusiast who learns the rules - adds to the value of the rest. A fax machine isn't worth much if there are no others to communicate with; board games aren't much fun if no one else knows how to play. Thus the whole adds to the value of each of its parts.

Network externalities - a term for the effect one person's decision to buy into a network has on others who are still thinking of buying in - have been the Net's rocket fuel: the more people who connect, the more valuable a connection becomes. But the Internet in turn is bringing network externalities to the economy as a whole.

Knowledge is affected by the same sorts of network externalities as Internet connections themselves; having the equipment to receive messages is no more important than having the knowledge to understand them. This explains why the future seems to happen so fast on the Internet. Change accelerates itself. And yesterday's arcane knowledge becomes today's essential information.

New economy *Software for a networked world.*

Today's electronically mediated global economy is the biggest, most complex adaptive system ever created (outside nature, anyway). Two centuries of industrialism spread productive capacity across the planet, built globe straddling communications, and inspired generations of workers to invest in education for both their children and themselves. And that in turn has created the underpinnings for the next great leap: from making things to making choices.

Unlike communism, the new economy doesn't seek to setup a separate new universe: it springs directly from late-20th-century capitalism's most vital centers. The people and companies of the new economy - from Bill Gates to Bangalore programmers - are today's global revolutionary vanguard. And the change they are spreading moves at literally the speed of light.

How far will the revolution go? A glance at who swings the economic weight in the world today - take another bow, Bill - should convince anyone that it won't be rolled back. And Moore's Law, network externalities, and the host of other forces described herein all point to an even more compelling answer: you ain't seen nothing yet.

New media *Communications for all, by all.*

Old media divides the world into producers and consumers: we're either authors or readers, broadcasters or viewers, entertainers or audiences. One-to-many communications, in the jargon. New media, by contrast, gives everybody a chance to speak as well as listen. Many speak to many - and the many speak back.

That doesn't mean tomorrow's prime-time television will consist of home videos and talk shows beamed live from the neighbors' living room. Talent - and marketing muscle - matters, and there will always be hit shows and stars. Television and other old media are not going to vanish, and neither will their proprietors. But they will face new competitors and transformed markets.

New media enables even the smallest, most scattered electronic communities to share - or sell - what they know, like, and do. What broadcasting atomized, new media brings back together.

One price, law of *No easy money.*

Even before Baron Reuter started his carrier-pigeon news service in 1850, people have known that having good information can mean easy money. But when everyone has a Bloomberg on their desk, opportunities to buy cheap and sell dear get harder and harder to find.

The law of one price says that in efficient markets, differences in price for the same item will tend toward zero. And indeed, in today's ever better informed markets, those spreads - asymmetries, to economists -are disappearing.

That is bad news for professional arbitrageurs, whose job of getting in the middle to keep markets moving - and picking up easy money doing it - is increasingly being handled by machines. Computers can compare prices far more quickly than can humans, and will happily execute millions of trades for a few cents' profit each. Indeed, as spreads have shrunk, only computers can really play the game. Which leaves their human tenders to more knowledge-intensive tasks - devising more complex financial derivatives for trading, to start with.

Open systems *Level playing fields.*

Most markets are open systems: anybody can compete.

Proprietary technologies, by contrast, close markets - the owner of the technology gets to choose who can compete and who can't. To let light and competition backing, more and more companies are buying open-systems technologies, whose inventors give up the role of gatekeeper in the conviction that, ultimately, they will gain more in competition-driven growth and innovation than they will lose in proprietary advantage.

Fans of open systems point to the Internet and the Web as examples of the explosive power of nonproprietary technologies. Suppliers compete. Customers choose.

The whole system itself evolves. And lock-in is avoided -except to the extent that a standard (VHS tapes, QWERTY keyboards) dominates so thoroughly that it locks out(possibly superior) alternatives.

There are other examples of open technologies: the formidable Unix operating system, the collectively developed free Web server Apache, and, most recently, Netscape's startling announcement that it will publish the source code of its popular browser. But companies hoping to have it both ways - to encourage outside innovation without giving up control - often exaggerate just how open their systems are. Microsoft, for instance, tries to claim that Windows is an open system because any software developer can write applications for Windows. Don't believe it - at least not until Bill Gates publishes enough technical information so that other companies can build their own versions of Windows to compete with Microsoft's. Any time soon, Bill?

Outsourcing *Buying instead of building.*

When Henry Ford opened his River Rouge automobile plant in 1927, iron ore rolled in through one gate and Model As rolled out the other. Today, Ford and other carmakers turn to outside suppliers for more than two thirds of the components that make up their products.

For cost-shaving computer makers like Dell and Compaq, it approaches 100 percent.

Ford did it all himself because nobody else could do it for him. Today's executives, by contrast, are spoiled by choice - and face daunting questions about where to invest their capital, financial and otherwise. Indeed, more and more of them are basing their strategies not on what they can make, but on what they can buy.

Last September, the US\$20 billion-a-year global food and clothing giant Sara Lee announced a three-year plan to "deverticalize" the company - selling off its manufacturing operations to focus on marketing and building brands. The British government has outsourced its tax system's computing to Ross Perot's old companies. Everywhere companies are trying to focus on doing only what they absolutely need to - the core competencies that bring the highest rates of return. The hard part, though, is defining what those special skills are. And what they are not - Microsoft's automated stuffed Barney doll, for example.

PC, introduction of Computers "R" Us.

In 1958, the *Harvard Business Review* predicted that the US economy would eventually be dominated by a handful of giant corporations, each organized around a huge mainframe computer. Less than 20 years later, two young garage entrepreneurs crossed some mildly innovative software with cheap new microprocessors and launched the Apple II. Four years later, Big Blue itself brought out the IBM PC - the power of a room-sized 1950s mainframe in a \$2,000 plastic box. Three hundred million desktop, laptop, and assorted other ever smaller computing devices later, the world looks - and thinks - a little different.

What's important to remember about the PC is that any big computer company could have made one years before Apple. But they didn't - in large part because they spoke mostly to existing clients, who had invested their careers in managing big computers and had little interesting little machines that enabled users to compute for themselves. Now that PCs are wired via the Internet, there are fewer excuses for not talking to everybody. But that doesn't mean companies will.

Test case: the network computer, putative successor to the PC. Some of the NC's strongest proponents are the same infocrats who never wanted PCs in the first place.

Because NCs take their software and data from a central server, they are easier and cheaper to manage than PCs.

But "easier to manage" and "smarter" are not the same thing - and even the cheapest system isn't worth the price if it doesn't help users make full use of their knowledge. PCs taught computer companies that lesson once already. Will NCs teach it again?

Photonics *Light is right.*

Anything electrons can communicate, nearly weightless photons can communicate better - or so the basic physics goes. Already today, instead of tiny bursts of electricity carried over copper wire, most digital data traveling more than a few miles is routed through fiber optic cable, as blips of light. And all-optical amplifiers and switches, which eliminate the inefficient back-and-forth between photons and electrons, are some of the hottest technologies around - as are the companies (like Lucent and Ciena) that make them.

Depending on where you live, a cable modem may soon bring huge fiber-optic bandwidth all the way to your living room, helped along by massive all-glass networks like Qwest's and by new technologies - dense wave division multiplexing, for one - that radically upgrade the carrying capacity of existing fiber. Upgrading the average desktop machine to handle fire-hose streams of bits will be an interesting - and lucrative - problem. But closing that gap also raises the ultimate "last mile" problem: building an optical microprocessor. Stay tuned.

Privacy *Vanishing species.*

Industrialism and privacy go hand in hand. Traditional mass-production companies had little reason to learn much about individual customers, because they couldn't do anything with the knowledge anyway. Mass customization creates a new dilemma: fear of companies knowing too much.

The problem is that the act of gathering information about customers makes some of those customers very nervous indeed. The (not unreasonable) worry is information gathered ostensibly to serve you better might someday be used against you. Or sold to someone with ill intentions.

Governments have already begun trying to regulate privacy - futilely. Over the long term, honesty and transparency are the best cures. Tell people what information you are gathering, and why. Explain to new prospects how you got their name. Be careful with whom you share customer information. Don't gossip.

And we'll all have to get used to the fact that there will simply be less privacy. Technology is creating a global village, and villages are not particularly private

places.

The healthy ones thrive instead on respect.

Privatization *Free at last.*

Even as recently as 30 years ago, the vast majority of the world's governments were convinced that nationalizing industries would solve the problems of capitalism, from labor strife to lack of innovation. What they discovered instead was that state-owned companies kept the old problems - and added some new ones, including busted government budgets and miserable management by clueless bureaucrats.

In the 1980s, Prime Minister Margaret Thatcher put British Telecom, British Gas, British Steel, and a host of other nationalized industries on the block, kicking off a global privatization bandwagon that is still going strong half a trillion US dollars in revenue later. Phone companies, broadcasting networks, railroads, airlines, heavy industries - and just about everything in Russia and Eastern Europe - have all been sold off to investors or doled out to employees. Even developing-world laggards are now following suit.

The easy billions have a price. One challenge is to avoid turning public monopolies into private ones. Another is to teach their coddled managers how to compete.

But overall the success of privatization - not least in lower prices and better service for customers - has fueled debate over what, apart from legislation and regulation, governments can deliver better than private industry. So far, from countries like the UK - which is busily outsourcing government services from garbage collection to taxes - the answer is: not much.

Productivity paradox *Where's the beef?*

Computers are now most businesses' biggest investment item. Executives say they buy the machines to boost productivity - to enable workers to do more each day.

Problem: even in the rip-roaring US economy, most standard statistics show that overall productivity growth has seldom been more sluggish - particularly among the very white-collar workers whose output should be benefitting most.

One obvious answer is that statistics designed to count cars coming off assembly lines are blind to what knowledge work is about - decisions made and new ideas. Erik Brynjolfsson of MIT's Sloan School did a microanalysis of investment in computers by 367 large US companies, with total sales of .8 trillion. The return stopped any other form of capital - an average of 81percent a year.

Another explanation is that it takes time for all companies to reorganize around new capabilities. Paul David, a Stanford economist, found that at the beginning of this century it took 20 years for factories to reap measurable benefits from the introduction of electric motors - and for national productivity statistics to capture the change.

None of this is likely to cause businesses to stop voting with their checkbooks for more and better technology.

But it does underscore the lack of reliable ways of measuring what computers are (and are not) doing. And without those, policymakers trying to manage the new economy will be flying blind even more than usual.

Restructuring *Building new companies out of old ones.*

Somewhere in the 1980s, corporate America woke up to realize that installing computers to automate the statuesque meant they didn't need to do things the old way anymore. So they began to rebuild their companies, with a vengeance. Out went systems designed around the limitations of paper; in came new ones designed around the freedoms of computers. Sequential processes, with workers pushing forms from department to department, became parallel ones, with workers sharing information stored in electronic databases. Companies decentralized,

even broke themselves up into smaller, better -focused pieces.

Millions of jobs have gone by the wayside. Some simply shifted sideways - packed off to burgeoning outside suppliers. But many just vanished - including the sorts of jobs held by well-educated, middle-class people who had previously thought of themselves as insulated from economic ill winds. Predictably, "downsizing" became both an epithet and opinion -page staple. But it also leveled the ground for the US boom of the 1990s -including unemployment that is the envy of stodgier Western Europe, and incomes higher than ever. Creative destruction may not always be pleasant, but it works.

Schumpeter, Joseph *Half prophet.*

"Creative destruction" is the battle cry of today's entrepreneurial Davids as they topple corporate Goliaths.

That instantly memorable summation of free-market capitalism entered the lexicon via European-born US economist Joseph Schumpeter (1883-1950). But the fine print is less comforting: Schumpeter also argued increasing returns from innovation would lead inevitably to a few big firms dominating. Indeed, in his best-known book, *Capitalism, Socialism, and Democracy* (1942), he concluded that capitalism contained the seeds of its own destruction: that monopoly -driven excesses would bring on socialist economic controls.

Schumpeter, who died when computers still filled large rooms, may have overestimated the importance of scale to an information-based economy. (Witness IBM, which lost its dominance over computer markets even while it spent more on R&D than many of its competitors had turnover.) Creative destruction, on the other hand, looks healthier than ever.

Securitization *Portable capital.*

The explosion of networked financial markets gives more people access to capital than ever before. And it gives it at wholesale rates. Securitization is the process of packaging financial obligations of all shapes and sizes into forms that can be freely traded on markets. Instead of borrowing from a retail bank, you go straight to the source: markets where investors with cash prowl hungrily for deals with prospects. In one case last year, David Bowie issued \$55 million worth of his own bonds, backed by the revenues on sales of his old hits. More prosaically, IPOs have raised more than \$200 billion over the past decade for investment in new companies and technologies. Securities are being traded based on mortgages, car loans, and other financial obligations, allowing banks to spread their risks, and so offer more credit, more cheaply.

Where will it end? For all their seeming insatiability, markets can trade only what they can quantify - and at the heart of many small deals lie unquantifiable like trust. Despite the rise of markets, most new ventures are still originally backed by friends or family. Markets will never replace moms, but they do mean that moms will need less money - and patience - than they used to.

Shrinkage *Smaller is beautiful.*

The average American company is now about a third smaller than it was 25 years ago, in sales and number of employees. Shed no tears: overall employment is up -two-thirds of US adults now work for a wage, while only half did in the 1950s - and the economy is growing steadily.

Why shrink? Studies by MIT's Erik Brynjolfsson found a correlation between shrinkage and IT investment. The theory is that computer networks make it easier for companies to shop around for suppliers, to outsource more and do less themselves. The sharper the focus, the greater the intensity each firm brings to bear.

The same applies on a macro level: the more small firms there are in an economy, the greater the speed and scale of competition and innovation. And thanks to

better communications, low-cost companies in the developing world can jump into the global market for computer components, for instance, without having to know how to build a whole PC. Smaller is more competitive, and it brings more competition.

Simulation *Learning by playing.*

Planning - the old-fashioned, long-term kind, anyway - is on the outs today at most big corporations. In an information-speed economy, there's no point in trying to predict the future in any great detail.

What companies can do is work on their reaction times.

Royal Dutch/Shell was one of the first to try this, in the early 1970s, when the company found it could no longer predict oil prices. Instead, Shell's planners came up with an array of possible scenarios, then worked through how to deal with each. Whether one of the scenarios ultimately proved right or not was immaterial. What mattered was what Shell executives learned about how their company - and the rest of industry - reacted to change.

Scenario planning today is helped by increasingly sophisticated simulation software, enabling executives to both build and play with models of how their companies and markets work. The US Air Force reports that Nintendo-generation fighter pilots take to their jobs faster thanks to reflexes honed by years of joystick-flexing. So too are a new generation of executives learning to outmaneuver the competition by sharpening their instincts and confidence with business gaming. From *Space Invaders* to market penetrators ... Who says computer games aren't educational?

Smith, Adam *Grandfather of the new economy.*

In industrialism's gray dawn, Adam Smith (1723 -1790) was one of the first to point out that individuals acting collectively, through markets, might just do things better, more innovatively, and more equitably than any individual or group could manage by fiat - not that this stopped governments from spending the next 200 years, millions of lives, and billions of dollars futilely trying to do just that. Smith's *The Wealth of Nations*, published in 1776, described how an "invisible hand" snatches progress from the seeming chaos of markets. But skeptical Scot that he was, Smith trusted businessmen - wannabe monopolists, in his view - no more than he trusted politicians. The market's the thing, Smith said, not the people in it.

Standards *Devise and rule.*

Companies used to compete by making things and selling them. In the new economy, the game is often over by the time the first product emerges from the factory.

Sometimes it's because a blow-away first entrant effectively sets - and thereafter "owns" - the standard. In other cases, winners (and losers) emerge from backroom bargaining over the technical details that enable complex technologies to work together - printers and computer software, for example, or DVD discs and next-generation audio equipment.

Sometimes this works in everyone's interest, particularly open-systems standards - TCP/IP and NTSC (the American television standard) are good examples - that are placed in the public domain for anyone to implement.

Just as often it doesn't. The most egregious recent standards rip-off is DVD, the next generation of audiovisual discs, from which Hollywood studios threatened to withhold their films unless coding was included to prevent discs recorded for the American market from being played in Europe. Needless to say, the studios now sell their products later and more expensively in Europe than in the United States. Building restrictions into technology is not what standards - or global markets - are about.

Supply chain *Virtual production lines.*

As companies look outward for more and more of the components of what they make or do, being a good shopper has become a key to competitive advantage.

That means knowing when to keep suppliers at arm's length - in order to maintain the freedom to shop elsewhere - and when to forge close relationships, to innovate together. It also means a new power struggle, as supplier and customer tussle over who should do what.

Wal-Mart, for example, uses its Retail Link network to give suppliers instant feedback about how their products are doing - what's in stock, what's moving, how competing goods have sold, and so on. In return, Wal-Mart expects the suppliers to tailor deliveries and promotions to meet Wal-Mart's needs. Wal-Mart warehouses less inventory - in some cases none at all - and still keeps its shelves stocked with what's hot.

Mass-market computer makers like Dell and Compaq are raising efficient supply chain - building to a high art. Tying your corporate destiny to other companies - particularly companies that might someday decide to become competitors - does not always make for restful nights.

But it works for customers - and it beats being run out of business by other companies more willing to take risks for the customer's benefit.

Technology *Smart tools.*

Industrial-age technology made workers mere cogs. The information revolution can't. Machines can go on churning out shoes or bolts whether anyone is watching or not. But today's technology is about communication, not production - and communication requires active human involvement. So if computers alienate the knowledge workers who are a company's lifeblood, or disrupt what they do to keep their knowledge fresh, they do more harm than good.

Time zones *The continents of cyberspace.*

In a networked world, which country you live in is less important than which time zone. To keep work going around the clock, companies simply hand off from wherever's going home to wherever's waking up - London to San Francisco to Hong Kong and back around in constant 24-hour motion. The sun never sets on a global economy.

Tipping points *Why timing is still all.*

In networks - and therefore markets - change tends to build slowly, then take off in a blast of high-octane growth. Economists call this nonlinearity. Epidemiology has a better phrase: tipping point.

Understanding why tipping points exist - increasing returns and positive feedback are at the root - is a lot easier than spotting one in the real world, let alone exploiting it. To do that, a company needs more than just being in the right place at the right time; it also has to have all of the components for growth gathered together, and pointing in the right direction. And one more thing: the same market surges that propel companies to vast success can just as easily shake them apart. Bo voyage.

Trading limits *Time-outs for markets.*

Financial markets put temporary halts on trading for the same reasons parents send misbehaving children upstairs - to stop an emotional cascade and let everyone catch their breath. But in markets, a break in the action also means a break in the flow of information about what things are worth. In other words, uncertainty - and just when the demand for clarity is greatest. In a global economy with billions of dollars in play, the result can be to simply push a panic downstream. Preset limits on how far a market can move in a given time period will stop the sort of death spiral that happened on the New York Stock Exchange in October 1987,

when computer-driven trading systems chased each other further and further down. But when automatic trading limits kicked in to stop a similar slide in October 1997, the NYSE was widely criticized for not allowing the market to recover its equilibrium - thereby fueling the Asian meltdown that had sparked the slide in the first place. Higher limits is one solution. So are truly global markets that never close - or we'll find out otherwise soon enough.

Transparency *What you know won't hurt you.*

Free-flowing information - transparency, in the jargon - is the key to efficient markets (not to mention good government). Look no further than Asia's erstwhile "tigers," whose multibillion-dollar national banking systems choked on their own smoke and mirrors.

Transparency builds confidence; secrecy builds fear.

Hence one of the IMF's main bailout conditions for the wounded Asian economies: real financial reporting, at all levels.

Even for individual businesses, secrecy may not be all it's cracked up to be. With the spread of the Internet, more and more companies are realizing that the benefits of swapping information - with customers, suppliers, even competitors - can often outweigh the costs.

Employers still fret about their companies' most valuable knowledge walking out the door each night. But the new economy - from Microsoft enlisting its customers as bug fixers to Wal-Mart putting its whole supply chain online - raises another possibility: the more you share with the rest of the world, the faster everyone learns.

Triple bottom line *Green business.*

Nobody likes a naysayer. Smart environmentalists worried about their movement seeming too Luddite have come up with a set of Earth-friendly business principles, often called the triple bottom line. The definition varies, but typically urges companies to be socially responsible, environmentally sound, and economically viable. The hard part, though, is defining just what "socially responsible" and "environmentally sound" might mean - and how to measure them. Not easy. The good news, though, is that it should be a lot easier to do when you're writing software than smelting pig iron.

Trust *Social capital.*

As historian Francis Fukuyama has pointed out, the free-wheeling, ad hoc organizations of the new economy can exist only if their members are willing to trust each other.

Which may be why the new economy is growing fastest in relatively new societies like the US - which have a tradition of getting along with strangers - and still struggling in more suspicious and traditional ones (France, Germany, and Japan). The good news, though, is that the Net helps to create its own social capital. Once someone you've never heard of has replied to your email request for information, you just might feel inspired to reply to some other stranger. And from small acts of faith, mighty economies grow.

Ubiquity *Be there now.*

Networks put everybody constantly in touch with everybody else. And that means you can sell anything anywhere to anyone, at any time. No need to get Joe Customer into the store - you can sell to him wherever he is, as soon as the impulse strikes him. In a networked economy, success goes to those who can insinuate themselves into that moment, when unarticulated desire - the urge, say, to buy a book or trade some shares - becomes real demand for a specific thing. And think of all the rent you're saving.

Value-based pricing *What the traffic will bear.*

Value-based pricing is capitalism at its most efficient: charging a variety of prices for the same product so that each customer pays just as much as it's worth to them.

Airlines today are the masters. But as ever heavier investment in technology makes the world more capital intensive, more and more companies are learning to play the game.

Computers make filling seats the easy part; it's keeping prices up that takes work. Airlines have spent decades building database profiles of their customers' habits, enabling them to create fares precisely targeted to appeal to each group - and only to that group. Who's willing to stay over Saturday night? Who will book in advance? What's the competition offering? The long distance phone business, with its ever more arcane range of options, is not far behind. Fiber-optic backbone and data-crunching mainframe computers are ready candidates, too. Take things far enough - which electronic networks are more than happy to do - and you arrive at the ultimate in value-based pricing: instantaneous open markets. Every price is special, just for you.

Volatility *Market bounce.*

Technology makes markets swing. Everybody hears more news faster, and everybody can trade on that news more easily. So they do. When news catches markets off balance, the result can be a pendulum effect. All the deals rushing in one direction carry prices further than traders think they should go - which sets everybody rushing back in the opposite direction.

Such overshooting helps explain why the New York Stock Exchange has acquired the unsettling habit of dropping several hundred points in a day, and then recovering as if nothing had happened. Over the short-term, coping with such market movements is forcing mergers among banks and finance houses - big ships handle big waves better. But longer term, volatility tends to be self-correcting. The more a market overshoots, the more speculators are attracted to the possibility of big profits. And the more money there is trying to second-, third-, and fourth-guess the market, the harder it is to build up the momentum to overshoot in the first place.

Winner takes all *Hollywood economics.*

Will Smith gets millions of dollars a picture not just because he's talented, but because information economics give Hollywood stars huge bargaining power.

Star power is a self-fulfilling prophecy: it lures audiences, and that lures backers, whose money makes the pictures that pull ticket buyers in.

The same dynamic applies to other kinds of information work, where attention-getting executives are starting to get star treatment - and salaries. That plays into a more general trend in developed countries, where the highest paid people are getting richer faster than the lowest - that is, income inequalities are widening. This does not have to be bad news: it may also be a sign of a more volatile and mobile economy, where an individual's income can vary widely from year to year. If people are bouncing in and out of the top and bottom groups, this "inequality" could in fact herald the advent of a more egalitarian opportunity-rich society, not a more unequal one.

WIPO *Law and order for ideas.*

From Windows 98 to the Golden Arches, today's most valuable assets are both portable and comically easy to copy. Despite endless attempts to counterfeit-proof computer programs, the Washington, DC-based Business Software Alliance estimates that worldwide losses due to software piracy now total more than \$13 billion a year. Even allowing for hype, that's an impressive figure. And companies like McDonald's, Coke, and Disney deploy SWAT teams of lawyers

around the globe, defending crown -jewel brands against the copycatting horde. Global legal standards are one answer to protecting global assets. The hard part is devising them, out of the hodgepodge of often conflicting national law. That unenviable job falls to the Geneva -based, UN -chartered World Intellectual Property Organization, whose brief also includes keeping the laws which govern the ownership of information up to speed with the technology that transmits it. Lately the 161-nation body has been busy indeed.

WIPO's December 1996 congress aimed to update copyright law for the digital age. A key proposal, powered by Hollywood, aimed to give content producers a tighter grip on electronic versions of their creations.

After weeks of argument, most of the proposal was thrown out by a newfound coalition of content-poor African countries and US high tech companies - on grounds that the proposed changes would stanch the very flows of information that are creating the new economy.

The debate will not end there. In an information economy, there are no more important rules than those governing the ownership of information itself. Protecting Coke's famed secret recipe is a piece of cake by comparison.

Work, disappearance of *Wishful thinking*.

Every time the economy changes, somebody predicts the end of work. And it never happens. The leisure revolution could have begun with the first steel plow or machine tool. It didn't, because instead of working less to live the same, people consistently choose to work as much - or more - to live better.

Computers don't replace human thought, they augment it- so there is no fundamental reason why they should reduce work. On the contrary, by enabling people to communicate increasingly complex ideas, they should actually increase it - which is exactly what appears to be happening. In the US, half the population worked in 1950; two-thirds work now. Not only that, but they work longer.

A recent Harris Poll found that the average American's working hours - self-described, admittedly - have crept up from 40 hours a week in 1973 to 50 hours a week in 1997.

What may be due for disappearance are traditional measures of work. The idea of the neatly measured eight hourday - itself a creation of the industrial revolution - doesn't fit in a world where work is done not at the factory or even at the office, but in the mind. And for most people that stays open at least 16 hours a day.

Zero-sum *What the new economy isn't*.

In 1980, MIT economist Lester Thurow peered into the future in *The Zero-Sum Society*. Seldom in the history of punditry has any grand theory been proved so wrong, so quickly. The United States, Thurow argued, could no longer expect improvement, expansion, or economic growth. Scarce resources and a "mature" economy meant that any improvement for one group brought corresponding losses for another. So government had to take control of the economy, to lower expectations and try to share the pie.

Shortly after the book's publication, the US economy embarked upon the longest period of sustained growth and innovation it has ever seen. Economists - many from Thurow's own university - demonstrated how information and knowledge enabled growth to build on itself. Far from zero-sum - what you have, I can't - knowledge resources can expand to fill all available heads, enabling everybody to build on everybody else's work.

Thurow has gone on to predict the imminent collapse of capitalism - don't hold your breath - which will force governments to take control of the economy. Start to seethe theme? Pessimism and government intervention - control by self-proclaimed seers of the future - run hand in hand in the old economy. The emergence of the new economy demonstrates that optimism is realism, too.

And that the people with the knowledge to make the economy grow are by

definition the most capable of keeping it growing. When everybody plays the game, everybody wins.