

55 Trends Now Shaping the Future

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INTRODUCTION

For more than four decades, Forecasting International (FI) has conducted an ongoing study of the forces changing our world. One of the values of tracking major trends over a long time frame is that we can see whether sudden shifts are indicators of seismic transitions or merely temporary anomalies or fads.

This latest edition of FI's periodic trend report adds two new trend areas to its knowledge base of major forces shaping the future: America's loss of technological supremacy (Trend 30) and new communications technologies (Trend 35.)

Forecasts stemming from these trends range from the very near term (2008-2012) to medium-range futures (up to 2025), but the authors make no attempt to speculate on very-long-range futures that may prove of little practical use. Whatever your concern, some of these trends will have a very direct impact upon it. Others will help to form the general environment in which we live and work. They all merit attention from anyone who must prepare for what lies ahead.

When reading this paper, please keep a notepad handy. We need to know how you believe each of these trends will affect policing, law enforcement, and police training. Please write down your thoughts about each trend; if any of these trends seem insignificant to the current purpose, just write "NA." In addition, please select the ten or 12 trends you believe most significant and rank them in order of importance. When done, forward the results to us at marglo@tili.com or Forecasting International, 3612 Boat Dock Drive, Falls Church, VA 22041. We thank you for your help in this project.

The Economy and Society

1. The economy of the developed world will continue to grow for at least the next five years. Any interruptions will be relatively short lived.

- The U.S. economy has been expanding continuously, though often weakly, since the fourth quarter of 2001. GDP grew by 3.2 percent in 2006, slowing to 2.6 percent in the fourth quarter of the year and just 0.7 percent in the first quarter of 2007. The consensus forecast calls for a rebound to 2.8 percent growth from the second quarter

through year's end, but this depends heavily on the course of private consumption.

- Job creation and unemployment numbers are puzzling. Unemployment rates hovered around 4.5 percent in the first half of 2007, which counts as nearly full employment. About 145,000 new jobs were created each month for the first six months of 2007, according to the official data, compared with 186,000 reported in 2006.

Washington says it takes 140,000 new jobs each month to absorb the new workers coming into the labor market. However, a year or two ago, when the population was smaller, 150,000 new workers were said to enter the market each month. New jobs are either drawing down unemployment or leaving some new workers jobless, depending on which number you believe.

There also is a major conflict between job surveys. For example, in April 2007, the Bureau of Labor Statistics reported that its survey of establishments, which tallies payrolls at selected companies, found 88,000 new jobs for the month, including 25,000 in government. In contrast, the BLS household survey, which actually asks people whether they are working, reported a loss of 468,000 jobs for the month! Most economists believe the survey of establishments gives a more accurate picture of employment than the household survey, and in general we agree. Yet there are a number of "fudge factors" built into the establishment survey that may or may not be valid. At the very least, the U.S. needs to get a better handle on its employment situation.

- Inflation remains under control according to official reports. Both the consumer price index and core inflation, neglecting energy and food prices, came in at 2.6 percent in 2006. In 2007, CPI has been sharply higher—up 7 percent, annualized, for the three months ending in May—thanks to spikes in the cost of energy and food. Core inflation rose by only 1.6 percent annualized for the three months ending in May. Government officials argue that core inflation is a more accurate reflection of long-term price trends because the cost of food and energy is so erratic. However, current increases in food and energy are due to long-term problems—the continuing imbalance between supply and demand of refined petroleum products and the growing diversion of corn to ethanol production. We believe that CPI is now a much better measure of the economy than core infla-

tion. If so, there may be trouble ahead for consumers.

- For the moment, those consumers do not seem to be seriously worried. In the first quarter of 2007, consumers spent 4.2 percent more than in the previous three months. Spending was off a bit in April, May, and June, but nowhere near as much as the rising CPI and monthly declines of about 0.1 percent in real household income might have suggested. Thus far, it seems that consumers will continue to keep the economy growing.

- How does all this add up? At Forecasting International, we believe the growth rate will average about 2.5 percent annually through 2008—a bit more in 2007, slightly less the following year. Until the employment picture becomes much clearer, we will not be truly confident of that number. However, we see no prospect of a significant downturn in the near future.

- The world's second economic dynamo, China, continues to whirl. Its GDP officially grew by 10.7 percent—adjusted for inflation—in 2006, with 11.4 percent forecast for 2007 and 2008. Thanks to China's hot export markets, the country's current-account surplus is huge, equivalent to 10.7 percent of GDP in 2007, with 9.8 percent expected in 2008.

In fact, China may be even wealthier than it seems. A study of its gray market in 2005, including "all illegal incomes, questionable incomes, and incomes of dubious origins," suggested that the true GDP may be 24 percent larger than the official numbers. This powerhouse will keep the global economy humming even if the United States cannot.

- In Germany, Europe's biggest economy is performing well. The country's GDP grew by 3 percent in 2006, its fastest growth since 2000. Inflation is at just 1.9 percent, and real incomes are rising, if only a little. There even are signs that German consumers are beginning to spend for the first time in years. The Conference Board's leading index for Germany was up 1.6 percent for the six months ending in April, with a sharp spike at the end of that period. Economists now predict that the GDP will grow by 2.9 percent in 2007 and 2.2 percent in 2008. The German economy still has structural problems that could worsen any future downturn. Yet for the moment it seems that good times should continue at least into 2010.

- The French GDP rose 2.1 percent in

2006, with growth of 2.2 percent expected in 2007 and 2008. That is the good news. Unfortunately, there is bad news as well. Unemployment is stuck above 8 percent. The Conference Board's leading indicator for France has been leveling off and actually declined slightly in May 2007. The French government absorbs 50.7 percent of the GDP in taxes but spends more, giving a budget deficit of 2.4 percent. Plans to cut taxes more than spending could put the deficit over the 3 percent allowed by the European Union. In all, there is room to wonder how long France can sustain its growth beyond 2008.

- The British economy grew by 2.8 percent in 2006 and continued growing at that rate, on average, through the first half of 2007. This is even better news than it seems, as the second quarter of 2007 marks the 60th consecutive quarter of growth in Britain. Measured by GDP and inflation, the British economy has been more stable than at any other time in memory; the longest previous run of continuous growth was just 19 quarters. Unemployment was only 5.5 percent in early 2007. Consumer spending has been strong, but was softening in early to mid-2007. Yet at mid-year, the Conference Board's leading index for the United Kingdom was growing at an annual rate of 4.5 percent. Short of a global recession, the UK's GDP seems destined to continue growing by 2.5 percent annually, or better, for the next few years.

- All this spells fairly good news for the European economy as a whole. Its aggregate GDP grew by 2.8 percent in 2006, its fastest rate in six years, with 2.7 percent growth forecast for 2007 and 2.3 percent for 2008. Modest weakness in France and Italy will be more than offset by the strength of Germany and the U.K. Europe will remain a sound trading partner for the U.S. and China for at least the next five years.

- Japan's GDP rose by 2.2 percent in 2006. In the fourth quarter of the year, growth hit 4.8 percent, its best showing in three years. That rate has slowed in 2007 but remains positive. Between November 2006 and May 2007, the Conference Board's index of leading indicators for Japan sank at a rate of 1.8 percent per year. Continued growth depends on spending by notoriously wary Japanese consumers. Nonetheless, the Organization for Economic Cooperation and Development predicts that Japan's GDP will grow by 2.4 percent in 2007 and

2.1 percent in 2008. The Japanese economy seems likely to remain healthy for at least a few years beyond that.

In the long run, Japan faces significant problems. Its population is aging, its working-age population is shrinking, and its birth rate is the lowest in the industrialized world and still declining. By 2030, the number of workers in Japan will shrink from its current 66 million to about 56 million. Over all, the country's population is expected to decline by 50 percent by 2075 and by two-thirds through 2100. At the same time, government debt equals 176 percent of GDP. This will make it extremely difficult for Tokyo to provide necessary services for tomorrow's elderly. Yet these are problems for the future. They will not affect Japan's economy during the period now under study.

- Worldwide, improved manufacturing technology will continue to boost productivity and reduce the unit cost of goods. At the same time, workers who remain on the job longer will offset slow growth in the labor force, while the globalization of business will keep pressure on salaries in the developed countries. Thus, both prices and wages should remain under control.

- New growth among all these trading partners should create a "benevolent cycle," in which the health of each partner helps to ensure the continued health of the rest for at least the next several years. In 2006, this process yielded 5.3 percent growth in the world economy, compared with a long-term average of 3.7 percent. Global growth is expected to come in at 5 percent in 2007, 4.8 percent in 2008, and 4.4 percent, on average, in the five years ending in 2013. If a rising tide lifts all boats, most of the world's countries should be floating high in the years ahead.

Implications: The current round of growth should continue for the remainder of this decade.

In the long run, the newly capitalist lands of the former Soviet Union should be among the fastest growing new markets, particularly if the oil industries of Kazakhstan and its neighbors can be developed promptly.

China has developed into an effective counterbalance for the U.S. economy. When America hits hard times, China can keep the world from following into recession. We first saw this in the post 9/11 crunch in the United States. This should

make the global economy much more stable for so long as China remains a vibrant trading nation.

By 2012 or so, India will expand faster than any other market in the world, with China falling into a close second place.

Labor markets will remain tight, particularly in skilled fields. This calls for new creativity in recruiting, benefits, and perks, especially profit sharing. This hypercompetitive business environment demands new emphasis on rewarding speed, creativity, and innovation within the workforce.

2. The world's population will grow to 9.2 billion by 2050.

- Average annual growth worldwide peaked at 2.19 percent in 1963 and has fallen steadily since. The U.S. Census Bureau's International Data Base projects that annual growth will fall below 1 percent in 2016 and below 0.5 percent by 2047.

- The greatest fertility is found in those countries least able to support their existing populations. Countries with the largest population increases between 2000 and 2050 include Palestinian Territory (217 percent), Niger (205 percent), Yemen (168 percent), Angola (162 percent), the Democratic Republic of Congo (161 percent), and Uganda (133 percent).

- The Muslim world is especially fertile, with fertility rates of 7.5 in Afghanistan, 6.0 in Yemen, and 4.9 in Iraq.

- Of the 2.7 billion extra people in the world in 2050, about 40 percent will live in sub-Saharan Africa and 30 percent in the Muslim world.

- Even these estimates may be much too low. According to the Center for Strategic and International Studies (CSIS), most official projections underestimate both fertility and future gains in longevity. They also assume that life expectancy will grow more slowly in the future, which seems unlikely.

- In contrast to the developing world, many industrialized countries will see fertility rates below the replacement level and hence significant declines in populations, excluding the effects of immigration. This means that the population of the developed nations will fall from 14 percent of the total world population in 2000 to only 10 percent in 2050.

- By 2015, the workforce in Japan and much of Europe will be shrinking by 1 percent per year. By the 2030s, it will contract by 1.5 percent annually.

Implications: Rapid population growth will reinforce U.S. domination of the global economy, as the European Union falls to third place behind the United States and China.

To meet human nutritional needs over the next 40 years, global agriculture will have to supply as much food as has been produced during all of human history.

Unless fertility in the developed lands climbs sharply, either would-be retirees will have to remain on the job, or the industrialized nations will have to encourage even more immigration from the developing world. The third alternative is an economic contraction and lower living standards.

Barring enactment of strict immigration controls, rapid migration will continue from the Southern Hemisphere to the North, and especially from former colonies to Europe. A growing percentage of job applicants in the United States and Europe will be recent immigrants from developing countries.

3. The population of the developed world is living longer.

- Each generation lives longer and remains healthier than the last. Since the beginning of the twentieth century, every generation in the United States has lived three years longer than the previous one. An 80-year-old in 1950 could expect 6.5 more years of life; today's 80-year-olds are likely to survive 8.5 more years.

- Life expectancy in Australia, Japan, and Switzerland is now over 75 years for males and over 80 for females.

- A major reason is the development of new pharmaceuticals and medical technologies, which are making it possible to prevent or cure diseases that would have been fatal to earlier generations. In many developed countries, credit also goes to government health programs, which have made these treatments available to many or all residents. In the developing lands, a primary cause is the availability of generic drugs, which cut the cost of care and make health affordable even for the poor.

- Medical advances that slow the fundamental process of aging now seem to be within reach. (This is a controversial issue within the medical community, but the evidence appears quite strong.) Such treatments could well help today's middle-aged Baby Boomers to live far longer than even CSIS anticipates. In the developed world, younger generations are likely to live rou-

tinely beyond the century mark.

Implications: Global demand for products and services aimed at the elderly will grow quickly in the immediate future, but this trend may pass as geriatric medicine improves the health of the elderly.

Any practical extension of the human life span will prolong health as well and will reduce the incidence of late-life disorders such as cancer, heart disease, arthritis, and possibly Alzheimer's disease. This would dramatically reduce demand for products and services in the senior market, at least in the developed world.

Developed countries may face social instability as a result of competition for resources between retirement-age Boomers and their working-age children and grandchildren. At the present rate of growth, public spending on retirement benefits in the United States and other developed countries could be one-fourth of GDP by 2050, even as the number of workers available to support each retiree declines sharply.

Barring dramatic advances in geriatric medicine, the cost of health care is destined to skyrocket throughout the developed lands. This could create the long-expected crisis in health-care financing and delivery.

However, dramatic advances in geriatric medicine are all but inevitable. Paying the high cost of new drugs and technologies will reduce the cost of caring for patients who would have suffered from disorders delayed, eased, or cured by new therapies. In the end, these reductions will offset many of the increases, leaving the average health-care bill in the developed lands much lower than the doomsayers predict.

This may offer new hope to the world's poorer, sicker lands. Faced with slow growth in their drug industries, western nations—particularly the United States—are likely to subsidize research and treatment for diseases that burden the poor countries of Africa and Asia. This will give those lands their first real prospects for economic growth and improved quality of life.

4. The elderly population is growing dramatically throughout the world.

- Worldwide, the elderly (age 65 and older) numbered 440 million and represented 6 percent of the population in 2002. Their numbers will nearly double by 2020 (to over 9 percent of total population) and more than triple by 2050 (to nearly 17 percent), according to the U.S. Census Bureau's In-

ternational Data Base.

- In the developed world, people over 65 made up 15 percent of the population in 2000, and will grow to 27 percent in the next half century, according to CSIS.

- Throughout the developed world, population growth is fastest among the elderly. In Europe, the United States, and Japan, the aged also form the wealthiest segment of society.

- In Germany, the retirement-age population will near 19 percent of the total in 2010 and will reach 31 percent in 2050.

- By 2050, one in three Italians will be over 65, nearly double the proportion of today.

- Japan's over-65 population will be 22 percent of the total in 2010 and nearly 37 percent in 2050.

- In the United States, at least, suburban populations are aging faster than those in the cities.

CSIS Aging Vulnerability Index (2003)

Low Vulnerability

1. Australia
2. United Kingdom
3. United States

Medium Vulnerability

4. Canada
5. Sweden
6. Japan
7. Germany
8. Netherlands
9. Belgium

High Vulnerability

10. France
11. Italy
12. Spain

Implications: Not counting immigration, the ratio of working-age people to retirees needing their support will plummet in the United States, Germany, Italy, Russia, Japan, and other countries. This represents a burden on national economies that will be difficult to sustain under current medical and social security systems.

In the next two to three decades, shortages of health workers will loom large in "aging vulnerable" countries. The United States in particular will need at least twice as many physicians specializing in geriat-

rics as its current 9,000, as well as half a million more nurses by 2020.

Suburban communities are likely to face a growing demand for social services such as senior day-care, public transportation, and other programs for the elderly. This will place a growing strain on local government budgets.

5. Technology is creating a knowledge-dependent global society.

- More and more businesses, and entire industries, are emerging that are based on the production and exchange of information and ideas rather than exclusively manufactured goods or other tangible products.
- The Internet has enabled small businesses throughout the world to compete for market share on an even footing with industry leaders.

- The number of Internet users in the United States more than doubled between 2000 and 2007, to nearly 231 million, or 69 percent of the population. Yet the percent of the population online has remained almost unchanged since 2004. About 70 percent now use broadband connections, but adoption of broadband has slowed markedly since 2005.

- In the United States, the “digital divide” seems to be disappearing. Internet access is increasing faster in black and Hispanic households as they catch up with white households. As of 2001, 32 percent of Hispanic and 30.8 percent of African American households were online. By early 2004, 61 percent of black children and 67 percent of Hispanic youngsters had Internet access at home, compared with 80 percent of white children.

- Digital appliances—whether computers, PDAs, or cell phones—are becoming more integrated, portable, and powerful.

Implications: Knowledge workers are generally better paid than less-skilled workers, and their proliferation may raise overall prosperity.

However, data and communications technologies also are exposing workers in the developed world to competition from low-wage countries. It is not yet clear at what pay level these competing forces will balance.

Even entry-level workers and those in formerly unskilled positions require a growing level of education. For a good career in almost any field, computer competence is mandatory. This is raising the level

of education required for a productive role in today’s workforce. For many workers, the opportunity for training thus is becoming one of the most desirable benefits any job can offer.

This trend also is enlarging the income gap between well educated workers and those with a high school degree or less. That gap will continue to grow.

In ten years, most digital devices will combine multimedia communication functions and real-time voice translation, so that conversations originating in one of seven or eight common languages can be heard in any of the others. These technologies will enable even more people to become knowledge workers, or at least knowledge-enhanced workers.

Telecommuting will make many companies more efficient and cut their expenses in the process.

New technologies create new industries, jobs, and career paths, which can bring new income to developing countries. An example is the transfer of functions such as technical support, and more recently R&D, to Asian divisions and service firms.

For some developing countries, computer skills are making it faster and easier to create wealth than a manufacturing economy ever could. India, for example, is rapidly growing a middle class, largely on the strength of its computer and telecom industries. Other lands will follow its example.

6. Mass migration is redistributing the world’s population.

- About 4 million people immigrated permanently to the countries of the Organization for Economic Cooperation and Development in 2005, 10.4 percent more than the year before.

- Immigration to western Europe from eastern Europe, North Africa, the Middle East, and the Indian subcontinent continues despite controls enacted in the wake of terrorist attacks.

- More than 400,000 legal immigrants from central Europe now live and work in western Europe. Between 3 million and 4 million more migrants are expected to join them in the next 25 years.

- In China, about 160 million people have moved from rural areas to cities in recent years.

- There are nearly 100 million international migrant workers in the world, according to the United Nations. About 30 million

live in Europe, 20 million in Africa, and 18 million in North America. These figures include only the workers themselves, not their dependents.

- Immigration is quickly changing the ethnic composition of the U.S. population. In 2000, Latinos made up 12.6 percent of the U.S. population; by 2050, they will account for 24.5 percent. Asians in the United States, currently 3.8 percent of the population, will comprise 8 percent by 2050, according to the latest U.S. Census Bureau figures.

- Higher fertility rates among the immigrant Latino population will accelerate this trend. As of 2002, women in the United States produced about two children during their lives, on average, just enough to maintain the population. Among Hispanics, the average was more than 2.7 births per woman. Among Mexican immigrants, it was nearly 2.9.

Implications: The rate of migration is likely to accelerate in the years ahead as native workforces shrink in most developed lands.

Impoverished migrants will place a growing strain on social-security systems in the industrialized countries of Europe and North America. Similar problems will continue to afflict the urban infrastructures of China and India.

Remittances from migrants to their native lands are helping to relieve poverty in many developing countries. Globally, these payments exceeded US\$230 billion in 2005, according to the World Bank.

Significant backlashes against foreign migrants, such as the skinhead movement in Europe, will be seen more frequently in the years ahead. They will appear even in the most peaceful lands. For example, in Scandinavia, resentment against foreign workers is strong, in part because they can return to their native lands after three years of employment and collect a pension equal to the minimum wage for the rest of their lives.

Since the terrorist attacks of September 11, 2001, and the rail bombings in London and Madrid, the large number of Muslim immigrants in Britain, France, and other European lands has inspired suspicion, and some persecution.

Unfortunately, suspicion is to some extent justified. A tiny minority of Muslim immigrants have proved to be linked to terrorist groups or have actually plotted or

carried out terrorist attacks. So have native-born Muslims. Immigration from regions such as Pakistan and North Africa exposes Europe to a growing risk of terrorism.

7. Despite some xenophobic reactions to immigrants, there is growing acceptance of diversity. However, this is subject to local interruptions and reversals.

- Migration is mixing disparate peoples and forcing them to find ways to coexist peacefully and productively.

- The Internet and other technologies promote long-distance communication and builds links between distant, and disparate, people.

- Mass media, including television, radio, films, interactive games, and music—are homogenizing forces in global culture as they promote a common language, mores, and cultural reference points. In the United States, for instance, television encourages the spread of standard accents and language patterns.

- The globalization of business is having a similar impact. Throughout the United States and Europe, regional differences, attitudes, incomes, and lifestyles are blurring as business carries people from one area to another.

- Intermarriage also continues to mix cultures geographically, ethnically, socially, and economically.

- Minorities are beginning to exert more influence over national agendas as the growing number of African-Americans, Hispanics, and Asians in the United States is mirrored by the expanding population of refugees and former “guest workers” throughout Europe.

- A poll by *Time* and Market & Opinion Research International found that 21 percent of young British adults viewed themselves as primarily European, rather than British. Some 31 percent of French Gen Xers, 36 percent of Germans, and 42 percent of Italians also said they thought of themselves as primarily European.

- However, in many countries there are powerful reactions against these changes. The growth of the German neo-Nazi movement after unification in 1992 is one obvious example, though public distaste for these views have kept extremists' activities in check.

Implications: While technologies increasingly facilitate cultural and professional exchanges around the world, local

conflicts will continue to erupt in societies where xenophobia is common.

Some of the most fervent “culturist” movements will continue to spring from religious fundamentalism that would-be dictators and strongmen can exploit to promote their own interests.

Terrorism will be a continuing problem long into the future, particularly in European nations with large, poorly integrated Muslim immigrant populations.

Companies will hire ever more minority workers and will be expected to adapt to their values and needs. Much of the burden of accommodating foreign-born residents will continue to fall on employers, who must make room for their languages and cultures in the workplace. Public schools and libraries must find more effective ways to educate this future workforce.

8. The global economy is growing more integrated.

- Companies are increasingly farming out high-cost, low-payoff secondary functions to suppliers, service firms, and consultants, many of them located in other countries.

- Companies in high-wage countries also are outsourcing management and service jobs to low-wage countries. An estimated 3.3 million U.S. jobs are expected to migrate to India and China by 2015. Some 40 million jobs are believed vulnerable to outsourcing.

- Parts for the new Boeing 787 “Dreamliner” are being constructed in at least eight countries around the world for assembly in the U.S.

- Toyota has manufacturing or assembly plants in Japan, Australia, Canada, Indonesia, Poland, South Africa, Turkey, the United Kingdom, the United States, France, Brazil, Pakistan, India, Argentina, Czech Republic, Mexico, Malaysia, Thailand, China, Vietnam, Venezuela, and the Philippines.

- Jobs in western Europe are migrating to eastern Europe, the former Soviet Union, and the English- and French-speaking former colonies of Africa. India has begun to ship jobs to even lower-cost countries in Africa.

- In the European Union, relaxation of border and capital controls and the adoption of a common currency and uniform product standards continue to make it easier for companies to distribute products and support functions throughout the Continent.

- The Internet continues to bring manufacturers closer to remote customers, cutting middlemen out of the distribution chain. Business-to-business (B2B) marketing on the Internet has brought new efficiency to many industries.

Implications: The growth of e-commerce enables businesses to shop globally for the cheapest raw materials and supplies. In niche markets, the Internet also makes it possible for small companies to compete with giants worldwide with relatively little investment.

This has brought new opportunities for quality-control problems and fraudulent cost-cutting by suppliers, as seen in the recent spate of tainted food and other products coming from China.

The Net also has created a generation of “e-preneurs” whose businesses exist largely on the Internet, with production, fulfillment, and other functions all outsourced to specialty firms.

Demand will continue to grow for employee incentives suited to other cultures, aid to executives going overseas, and the many other aspects of doing business in foreign countries

However, rising demand for foreign-language training is likely to be a temporary phenomenon, as more countries adopt English as part of their basic school curricula.

Western companies may have to accept that proprietary information will be shared not just with their immediate partners in Asian joint ventures, but also with other members of the partners' trading conglomerates. In high technology and aerospace, that may expose companies to extra scrutiny due to national-security concerns.

9. Militant Islam continues to spread and gain power.

- It has been clear for years that the Muslim lands face severe problems with religious extremists dedicated to advancing their political, social, and doctrinal views by any means necessary. Those problems often have spilled over into the rest of the world. They will do so again.

- In a 1994 terrorism study for the Department of Defense and other government clients, Forecasting International predicted that by 2020 a strong majority of the world's 25 or so most important Muslim lands could be in the hands of extremist religious governments. At the time, only Iran was ruled by such a regime.

- Most of the Muslim lands are overcrowded and short of resources. Many are poor, save for the oil-rich states of the Middle East. Virtually all have large populations of young men, often unemployed, who are frequently attracted to violent extremist movements.

- During its proxy war with the Soviet Union in Afghanistan, the United States massively fortified the Muslim extremist infrastructure by supplying it with money, arms, and above all training.

- It is making a similar mistake today. The overthrow of Saddam Hussein and the American occupation of Iraq has inspired a new generation of *jihadis*, who have been trained and battle-hardened in the growing insurgency.

- In a now-declassified National Security Estimate, the American intelligence community concluded that Al Qaeda was more powerful in 2007 than it had been before the so-called “war on terror” began—more dangerous even than it had been when it planned the attacks of September 11, 2001.

- American support for Israel has also made the United States a target for the hatred of Muslim extremists.

Implications: Virtually all of the Muslim lands face an uncertain, and possibly bleak, future of political instability and growing violence. The exceptions are the oil states, where money can still buy relative peace, at least for now.

Saudi Arabia easily could be taken over by a fundamentalist regime. The Saudi rulers may well try to avoid this by providing even more support to extremists and directing their attention to the West.

The overthrow of the Taliban in Afghanistan, and especially of Saddam Hussein in Iraq, have made future fundamentalist revolutions more likely, rather than less so, because it has strengthened the global *jihadi* movement.

Iraq is likely to become the next fundamentalist Muslim regime. Once American forces leave, Iran will support the establishment of a Shiite regime much like its own in Baghdad.

There is a one-in-ten chance that this will set off a general war in the Middle East, as Sunni-dominated states intercede to protect Iraqi Sunnis against Shi’a domination. However, Iraq and Saudi Arabia already are negotiating to keep this situation under control.

The West, and particularly the United

States, must expect more—and more violent—acts of terrorism for at least the next 20 years.

Europe and the United States faces homegrown Muslim extremist movements. Thanks largely to waves of immigration since the 1980s, Islam is the fastest-growing religion in both regions. Extremist clerics in Europe are recruiting young Muslims to the cause of *jihad* against their adopted homes. Their colleagues in the U.S. have been much less successful.

Western interests also will be vulnerable in many countries outside the Muslim core. International ties formed among Islamic militants during the anti-Soviet war in Afghanistan produced an extremist infrastructure that can support terrorist activities almost anywhere in the world. The war in Iraq is doing so even more efficiently.

This development must be taken even more seriously, because for the first time a Muslim country—Pakistan—has nuclear weapons. Muslim extremists view this technology as an “Islamic bomb” that could be used to promote their cause. From here on out, nuclear terrorism is a realistic threat.

This risk will grow as Sudan, Iraq, and probably other countries establish fundamentalist regimes sympathetic to the cause of *jihad* against the West.

Values, Concerns, and Lifestyles

10. Societal values are changing rapidly.

- Industrialization raises educational levels, changes attitudes toward authority, reduces fertility, alters gender roles, and encourages broader political participation. This process is just beginning throughout the developing world. Witness the growing literacy, declining fertility, and broad voter turnout seen in India over the last decade.

- Developed societies increasingly take their cue from Gen X and the Millennial generation (aka Gen Y or Generation Dot-com), rather than the Baby Boomers who dominated its thinking for most of four decades. This will tend to homogenize basic attitudes throughout the world, because Gen Xers and especially the Millennials around the globe have more in common with each other than with their parents.

- Millennials value, and display, both self-reliance and cooperation. They need

self-reliance because they believe individuals can no longer count on government social-security income, pensions, or other benefits. They value, and are good at, cooperation because group action often is the best way to optimize the use of scarce resources, such as retirement savings.

- Post-September 11 fear of terrorist attacks has led Americans to accept almost without comment security measures that their traditional love of privacy once would have made intolerable. This continues a long-established tendency in the United States to prefer a greater sense of safety at the cost of increased government surveillance and intervention in their lives.

Implications: The highly polarized political environment that has plagued the United States since the 1980s will slowly moderate as results-oriented Gen Xers and Millennials begin to dominate the national dialogue.

As national security concerns have begun to lose their immediacy, family issues are regaining their significance in American society: long-term health care, day care, early childhood education, antidrug campaigns, and the environment. Concerns about health care, education, and the environment already are shaping the 2008 presidential campaign.

Demand for greater accountability and transparency in business will be crucial for countries that wish to attract international investors.

Reaction against changing values is one of the prime motives of cultural extremism, particularly in the Muslim world and in parts of India.

11. Young people place increasing importance on economic success, which they have come to expect.

- Throughout the 1990s—effectively, their entire adult lives—Gen Xers and the Millennials knew only good economic times, and the economic downturn at the turn of the century seemed to them a confusing aberration rather than a predictable part of the business cycle. Most expect to see hardship on a national level, but they both want and expect prosperity for themselves.

- Growing numbers of people now become entrepreneurs. Gen Xers and the Millennials are the most entrepreneurial generations in history.

- In the United States especially, most

young people have high aspirations, but many lack the means to achieve them. High-school dropout rates average between 18 and 30 percent, depending on who does the counting. Inner-city rates are much higher by anyone's measure, with up to half of all students leaving high school before graduation in the worst districts.

Only about one in four high-school graduates goes on to receive a college degree. Many of the rest wish to go, but cannot afford the high cost of further schooling.

- Without higher education, expectations may never be met. On average, someone with a bachelor's degree in the United States earned nearly \$51,554 in 2004, compared with less than \$28,645 for someone with only a high school diploma. High-school dropouts earned just \$19,169, while those with advanced degrees raked in \$78,093.

Implications: Entrepreneurialism will be a global trend, as members of Generation X and the Millennials throughout the world tend to share values. Gen X and Millennial entrepreneurs are largely responsible for the current economic growth in India and China, where they are becoming a major force in the Communist party. In India, the younger generations dress and think more like their American counterparts than their parents. In China, the democratic fervor that spawned Tiananmen Square has been replaced by capitalist entrepreneurialism.

If younger-generation workers find their ambitions thwarted, they will create growing pressure for economic and social reform. If change does not come fast enough in the developing world, disappointed expectations will raise the number of young people who emigrate to the developed lands.

Disappointment also will drive underemployed young men in the developing world into fringe political and religious movements. This will add to future terrorism and instability, with profound effects on the cultures and economies of both their home lands and the target countries.

12. Tourism, vacationing, and travel (especially international) will continue to grow in the next decade and beyond.

- International tourism grew by more than 6 percent in the first half of 2007, thanks in part to general prosperity in the developed lands. By 2020, international tourist arrivals are expected to reach 1.6

billion annually, about double the 842 million seen in 2006.

- The number of Americans traveling to foreign countries (excluding Canada and Mexico) crashed following the September 11 attacks. Today, their numbers are growing by about 5.5 percent annually, even faster than before 2001.

- In contrast, the United States received only 21.7 visitors from countries other than Canada and Mexico, down 17 percent from the peak in 2001. The decline stems from tighter American entry restrictions enacted in the name of security and international hostility inspired by the Iraq war.

- However, U.S. domestic tourism is growing about 2.3 percent each year.

- Chinese spending for international travel will reach \$100 billion by 2008. By 2020, according to the World Trade Organization, 100 million Chinese will fan out across the globe, replacing Americans, Japanese, and Germans as the world's most numerous travelers. Some 50 million Indian tourists will join them.

- China soon will become the world's most popular destination as well, as preparations for the 2008 Summer Olympic Games focus international attention on Beijing. By 2020, China can expect 130 million international arrivals.

- Online travel services are displacing traditional travel agencies in all but cruises and other luxury markets. In the U.S., the online travel industry grossed \$79 billion in 2006. It is expected to take in more than \$94 billion in 2007 and \$146 billion by 2010.

- Multiple, shorter vacations spread throughout the year are continuing to replace the traditional two-week vacation.

Implications: Travel will grow by at least 5 percent per year for the foreseeable future.

Tourism offers growing opportunities for out-of-the-way destinations that have not yet cashed in on the boom. This will make it an important industry for still more developing countries.

American domestic tourism will continue to grow by an average of 2.3 percent per year through at least 2011.

The tourism industry will create 3.3 million new jobs worldwide. Jobs dependent on tourism will comprise nearly 14 percent of the global workforce.

Direct employment will not grow quite as quickly, but it will be up 1.7 percent an-

nually, to nearly 87.5 million jobs, while indirect employment will account for some 260 million jobs around the world.

This will bring major opportunities for the travel industries of Southeast Asia and Africa, where Chinese and Indian tourists can take quick, inexpensive vacations.

Retirees who travel off-season will further ease the cyclical peaks and valleys typical of the industry.

Cruise ships will continue to lure retirees. Some liners are offering full-time residency—creating new options for assisted living arrangements.

13. The physical-culture and personal-health movements will remain strong, but far from universal.

- Emphasis on preventive medicine continues to grow. Of late, a few insurance carriers—but more each year—have expanded coverage or reduced premiums for policyholders with healthy lifestyles.

- Where change has been slow, legislation has sometimes mandated it. Since 2005, more than half of states have required insurers to pay for mammograms.

- Health is continuing to improve in the United States, but less quickly. During the 1990s, health in the United States improved by 1.5 percent annually, based on such measures as smoking prevalence, health-insurance coverage, infant mortality rates, and premature deaths. During the 2000s, health improvement has slowed to just 0.2 percent a year, largely due to personal choices.

- The current epidemic of obesity is especially troubling. Among children, overweight has tripled since 1980, to about 18 percent for those age six or older.

- Health consciousness is spreading to Europe. For example, a recent poll found that two-thirds of Britons now spend more to maintain a healthy lifestyle than they did a decade ago, and three out of four say they enjoy leading a healthy lifestyle.

- Unfortunately, much of the developing world still worries more about eating enough than about eating well.

- Smoking is in general decline in the United States. Only 21 percent of Americans smoked cigarettes as of 2005, down from 30 percent in 1983. About 42.5 percent of current smokers reported that they had tried to stop smoking within the last year. However, the percentage of smokers has stabilized since 2000.

- The antismoking movement is finally

making its way to Europe. Ireland banned smoking from its pubs late in April 2004. In 2006, France banned smoking in public facilities. Britain followed suit in 2007.

- The global obesity crisis is a significant countertrend to the physical-culture movement. Poor diet, physical inactivity, and associated obesity contribute to 47 percent of diseases and 60 percent of deaths worldwide.

- Developing countries that "Westernize" their diets by consuming more foods high in fat, sugar, and salt are at risk of epidemic obesity, including among children and adolescents.

Implications: As the nutrition and wellness movements spread, they will further improve the health of the elderly.

Better health in later life will make us still more conscious of our appearance and physical condition. Thus, health clubs will continue to boom, and some will specialize in the needs of older fitness buffs. Diet, fitness, stress control, and wellness programs will prosper.

States will continue to mandate insurance coverage of mammography. By 2012, they will begin to require coverage of sigmoidoscopy.

By 2015, Congress will add coverage of many preventive-care activities to Medicare.

The cost of health care for American Baby Boomers and their children could be much lower in later life than is now believed. However, Asia faces an epidemic of cancer, heart disease, emphysema, and other chronic and fatal illnesses related to health habits.

Like tobacco companies, producers of snack foods, liquor, and other unhealthy products will increasingly target markets in developing countries where this trend has yet to be felt.

Chronic diseases related to obesity burden national economies and could thwart economic progress in developing countries.

14. Consumerism is still growing.

- A networked society is a consumerist society. Shoppers increasingly have access to information about pricing, services, delivery time, and customer reviews on the Internet. Marketers, of course, also can check the competition's offerings. This may gradually halt the decline of prices and shift competition increasingly to improve-

ments in service and salesmanship.

- A possible reaction to this trend began in June 2007 when the U.S. Supreme Court threw out a longstanding rule and decreed that manufacturers have the right to set minimum retail prices for their products.

- Children in the United States become shoppers as young as age six and become aware of brands at age two or three, due largely to child-focused advertising.

- The Millennial generation is becoming increasingly prone to compulsive spending. In the United States, 10 percent of Millennials can be classified as clinically compulsive spenders, compared with 5 percent of Gen Xers and perhaps 3 percent of Baby Boomers.

Implications: Europe, Japan, China, and other markets are undergoing the same revolution that has replaced America's neighborhood stores with cost-cutting warehouse operations, discounters such as Wal-Mart, and "category killers" like Staples and Home Depot.

However, the cultural and political power of farmers and small shop owners has slowed this trend in some areas, particularly in Japan.

Consumer advocacy agencies and organizations will continue to proliferate, promoting improved content labels, warning notices, nutrition data, and the like on packaging, TV, the Internet, and even restaurant menus.

Thanks to recent contamination of food imported from China, the U.S. Food and Drug Administration will be required to improve screening of incoming food products. However, it will not receive adequate funding to do the job effectively.

As prices fall to commodity levels and online stores can list virtually every product and brand in their industry without significant overhead, service is the only field left in which marketers on and off the Internet can compete effectively.

Branded items with good reputations are even more important for developing repeat business.

Consumer debt may be an even greater problem for Millennials than it has been for their elders.

15. The women's equality movement is losing the last of its significance, thanks largely to past successes.

- Some 70 million women, 59 percent of those age 16 and older, participated in

the U.S. labor force in 2006. Among those ages 25 to 54, more than three-fourths either held a job or were looking for one. Three-fourths of employed women worked full-time.

- Gen Xers and Millennials are virtually gender-blind in the workplace, compared with older generations. This is true even in societies such as India and Japan, which have long been male-dominated, though not yet in conservative Muslim lands.

- Younger generations of women are better educated. Fully 58 percent of American college students were women as of 2006. Among whites, only 56 percent are female, but 60 percent of African-American college students are women. Among students over age 25, nearly two-thirds are women. And women earn nearly 60 percent of the bachelor's and master's degrees awarded in the U.S.

- There were nearly 6.5 million women-owned businesses in 2002, up 20 percent from 1997. The increase was twice the national average for all businesses. Most are small retail and service operations that offer few opportunities to build major corporations.

- Corporations are adding more women to their boards of directors. In Britain's top 20 firms, 90 percent now have at least one female director on their boards, reports the U.K. Department of Trade and Industry. In the U.S., 14.6 percent of the directors at *Fortune* 500 companies were women as of 2006.

- An infrastructure is evolving that allows women to make more decisions and to exercise political power, especially where both spouses work. One indication of growing dependence on the wife: Life insurance companies are selling more policies to women than to men.

- More women are entering the professions, politics, and the judiciary. As we have seen in Iraq, they also are finding roles as combat soldiers.

- From 1979 to 2005, median wages for women in the U.S. with college degrees rose by 58 percent. Their male counterparts saw pay hikes of only 24 percent over the period.

- In 2004, one-third of American women earned more than their husbands, up from 24 percent in 1987.

- According to some, though not all, studies, women have nearly achieved pay parity with men in the U.S. when factors

such as educational level, responsibilities, and seniority are taken into account.

Implications: In the developed world, whatever careers remain relatively closed to women will open wide in the years ahead.

There is little sign of progress for women in much of the developing world. India is an exception, because growing literacy has given women the chance to earn income outside the home, and with it value other than as wives and mothers.

Women's increasing entrepreneurialism will allow the formation of entrenched "old girl" networks comparable to the men's relationships that once dominated business.

The fraction of women entering the American labor force has leveled off in recent years. The percentage of female workers is likely to remain approximately stable until some force appears to begin a new trend.

Demand for child care and other family-oriented services will continue to grow, particularly in the United States, where national services have yet to develop. Over the next 20 years, American companies may increasingly follow the example of their counterparts in Europe, whose taxes pay for national daycare programs and other social services the United States lacks.

16. Family structures are becoming more diverse.

- In periods of economic difficulty, children and grandchildren move back in with parents and grandparents to save on living expenses. Many bring their own children with them. In the United States, one-third of Gen Xers have returned home at some point in their early lives. Among Millennials, the figure is even higher.

- ◆ The 2001 Census found that "multigenerational households" are the fastest growing group in the U.S.

- Many grandparents are raising their grandchildren, because drugs and AIDS have left the middle generation either unable or unavailable to care for their children. This trend is strongest in Africa, where AIDS has orphaned some 12 million children, half between the ages of 10 and 14. In Botswana, Lesotho, Swaziland, and Zimbabwe, more than one in five children will be orphaned by 2010 according to UNICEF. At that time, there will be 25 million AIDS orphans in sub-Saharan Africa. In the seven African countries most affected by AIDS, life expectancy at birth

has now dropped below 40.

- Among the poor, grandparents also provide live-in day care for the children of single mothers trying to gain an education or build a career.

- At least five American states now permit same-sex marriage or have enacted domestic-partnership laws that provide similar protections: Massachusetts, California, New Jersey, Connecticut, and New Hampshire. In this, they join such countries as Denmark, Germany, the Czech Republic, the United Kingdom, and most recently Switzerland. Many American companies now grant spousal benefits to the same-sex partners of employees, even where states do not.

- Yet the nuclear family also is rebounding in the United States, as Baby-Boom and Gen-X parents focus on their children and grandparents retain more independence and mobility.

Implications: Tax and welfare policies need adjustment to cope with families in which heads of households are retired or unable to work.

Policies also need modification for those who receive Social Security and are forced to work to support an extended family.

In the United States, the debates over homosexuality and the "decline of the family" will remain polarizing for the foreseeable future.

The next debate is likely to focus on granting parental rights to more than two parents, as when a sperm or egg donor wants a role in the life of a child whose official parents are the recipients.

17. Privacy, once a defining right for Americans, is dying in many lands.

- Widespread surveillance of private individuals is technically feasible and economically viable, as tiny, powerful cameras now cost next to nothing. Increased surveillance has become socially acceptable in an age when many people fear terrorism and crime.

- The USA Patriot Act of 2001 sets aside the constitutional requirement of a search warrant for government officials who wish to search someone's home in order to thwart possible terrorism. Its provisions have been used to justify searches in pursuit of drug dealers and even, in one attempt thus far blocked by the courts, copyright abusers.

- Cell phone conversations are presumed not to be private, opening them to govern-

ment eavesdropping at will.

- The contents of most Internet-connected computers are open to virtually unobstructed snooping by anyone with a minimum of skill and the will to examine them. All but the most secure can be invaded by more capable hackers.

- In Britain, an estimated 4.2 million surveillance cameras watch over streets, office buildings, schools, and shopping centers, making the U.K. one of the most closely monitored nations in the world. On average, Britons are caught on camera an estimated 300 times per day.

- In the United States, the growth of surveillance also is driven by the fear that lawsuits following a future terrorist attack could claim that failure to install monitoring equipment constitutes negligence.

- Video surveillance systems have been installed in New York City; Washington, D.C.; Houston; Tampa, FL; and other cities around the U.S. Protests thus far have been small and ineffective.

Implications: Most surveillance provisions of the USA Patriot Act will survive, even if the law itself is repealed or modified.

In the absence of a major terrorist event, most Americans will continue to consider privacy a "right," and privacy-related lawsuits will likely increase as more people feel violated or inconvenienced by surveillance. However, courts will be unsympathetic to such suits for so long as conservative appointees dominate the bench.

In large and medium-sized cities around the world, spaces that remain unwatched by video cameras will continue to shrink.

Growing numbers of companies, and even private citizens, will encrypt their computer data.

The number of criminal cases based on surveillance will grow rapidly in countries with the required technological sophistication and infrastructure.

Private citizens increasingly will use similar technologies to watch over government abuse, as in cases where bystanders have recorded police misconduct with their cell-phone cameras.

Energy

18. Despite efforts to develop alternative sources of energy, oil consumption is still rising rapidly.

- The world used only 57 million barrels of oil per day in 1973, when the first major price shock hit. By 2004, it was using 83 million barrels daily, according to the U.S. Energy Information Administration. Consumption is expected to reach 97 million barrels daily by 2015 and 118 million by 2030.

- However, oil's share of world energy consumption has begun to decline: It is expected to drop from 40 percent in 1999 to about 37 percent in 2020.

- The United States consumes about 20.7 million barrels of oil per day. Nearly 60 percent of that is imported.

- In 2005, the most recent data available, China consumed 6.534 million barrels of oil, making it the second-largest user of oil in the world. Its oil demand has grown by 7 percent per year, on average, since 1990. Most of China's imported oil (more than 3.1 million barrels a day) comes from the Middle East.

Implications: Oil prices now are high enough to provide an incentive to develop new fields, such as the Arctic National Wildlife Refuge and the deep fields under the Gulf of Mexico.

Environmentally sensitive areas will be developed using drilling techniques, double-walled pipelines, and other precautions that make it possible to extract oil with less damage to the surroundings. But they will be developed.

19. Contrary to popular belief, the world is not about to run out of oil.

- Claims that the world's oil reserves may be up to 20 percent smaller than previously believed are not credible, in part because they originate with an odd coalition of the American Petroleum Institute and alternative energy proponents—two groups with a vested interest in keeping oil prices high.

- In any event, 80 percent of OPEC's estimated supply would still be oil enough to supply the world for the next 64 years.

- As a result of intensive exploration, the world's proven oil reserves climbed steadily since the 1980s and now hover at over 1.3 trillion barrels. Natural gas reserves stand at about 6.2 trillion cubic feet in 2007, about 1 percent more than a year earlier.

- Recent discoveries of major oil fields in Canada and under the Gulf of Mexico have substantially increased the world's

known oil reserves.

- OPEC officials claim that the 11 member countries can provide for the world's energy needs for roughly the next 80 years. OPEC supplies about 40 percent of the world's oil and holds 60 percent of the known oil available internationally.

- Oil production outside the OPEC nations has not yet peaked.

- Exploitation of oil in Venezuela has barely begun. Reserves there may be even larger than those in Saudi Arabia, according to some estimates. However, it is more expensive to refine and use, because it contains much higher levels of sulfur than the Middle Eastern oil currently in production.

- India also is believed to own substantial reserves of oil in deposits beneath the Indian Ocean.

Implications: Higher oil prices should make it cost effective to develop new methods of recovering oil from old wells. Technologies already developed could add nearly 50 percent to the world's recoverable oil supply.

OPEC will continue to supply most of the oil used by the developed world. According to the U.S. Department of Energy, OPEC oil production will grow to about 57 million barrels of oil per day by 2020.

Russia and Kazakhstan will be major suppliers if the necessary pipelines can be completed and political uncertainties do not block investment by Western oil companies. Russia will grow into the world's second-largest oil producer by 2010.

Alternative energy sources face problems with economic viability. Barring substantial incentives, this will inhibit efforts to stem global warming for the foreseeable future.

A generalized war in the Middle East after the United States leaves Iraq could drastically reduce the region's oil output. This is unlikely, but the impact of such a conflict would be too large to ignore the possibility.

The spread of fundamentalist Muslim regimes with a grudge against the West also could keep OPEC oil out of the American market.

If the United States loses access to Middle Eastern oil, it will buy even more from Canada and Venezuela, tap the Arctic National Wildlife Reserve, and develop the deep-water fields under the Gulf of Mexico much faster than expected.

America also would be likely to develop

its vast reserves of oil shale, which have long been economically viable at crude prices over \$40 per barrel. New technology reportedly makes it profitable at any price over \$17 per barrel. With enough shale oil to supply its own needs for 300 years, the U.S. could become one of the world's largest petroleum exporters.

Developing shale would devastate the environment, but with crude oil prices in triple digits during a Mid-East war the environment will be considered expendable.

20. Oil prices are stable around \$45 per barrel when not perturbed by political or economic instability.

- Prices above \$70 per barrel seen since 2004 are an aberration caused by the Iraq war and a global shortage of refinery capacity.

- Yet new energy demand from the fast-growing economies of China and India has raised the floor that until 2004 supported oil in the \$25 per barrel range.

- New oil supplies are being developed in the former Soviet Union, China, and other parts of the world.

- The 20 most-industrialized countries all have at least three-month supplies of oil in tankers and underground storage. Most have another three months' worth in "strategic reserves." In times of high oil prices, customer nations can afford to stop buying until the costs come down.

- New refineries in Saudi Arabia and other countries are scheduled to come on line by 2010.

Implications: In response to high (by American standards) gas prices, the U.S. government probably will boost domestic oil production and refining to increase the reserve of gasoline and heating oil. This stockpile would be ready for immediate use in case of future price hikes. This will make it easier to negotiate with OPEC.

A key step in controlling oil prices, and an indicator of Washington's serious about doing so, would be development of at least four new refineries around the country by the government, probably for lease to commercial producers. We rate the odds at no more than 50:50.

The United States almost certainly will drill for oil in the Arctic National Wildlife Reserve, though efforts will be made to minimize environmental damage, such as drilling will take place only in the winter, when the tundra is rock hard.

By 2020, the new fields under the Gulf of Mexico will come online, putting even more pressure on oil prices.

21. Growing competition from other energy sources also will help to limit the price of oil.

- Nuclear plants supply about 15 percent Russian electricity. Plans call for construction of 26 more nuclear plants by 2030, when 25 percent or more of the nation's electricity will be nuclear.
- In early 2004, China had only nine operating nuclear power plants. It plans to build 30 more by 2020, bringing nuclear energy consumption from 16 billion kWh in 2000 to 142 billion kWh in 2020.
- By 2020, Russia will consume 129 billion kWh of nuclear energy per year, while Canada will use 118 billion kWh. Even the United States is weighing the construction of new reactors.
- In contrast, hydroelectric power generation has been declining since its 1996 peak of 727.62 billion kWh.
- Solar, geothermal, wind, and wave energy will ease power problems where these resources are most readily available, though they will supply only a very small fraction of the world's energy in the foreseeable future.
- Renewable sources accounted for about 14 percent of the world's energy in 2005. However, more than half of this came from hydroelectric dams, which have their own environmental issues and are no longer a growing segment of the industry.
- Worldwide wind-power generating capacity grew by 30 percent annually in the decade ending in 2003, to a total of 40,000 MW.
- Photovoltaic solar energy production has been growing at a steady 25 percent per year since 1980. Commercial solar cells are now cheap enough to compete with other power sources, especially in sunny regions.
- Natural gas burns cleanly, and there is enough of it available to supply the world's total energy demand for the next 200 years. Consumption of natural gas is growing by 3.3 percent annually, compared with 1.8 percent for oil.
- Although most of the world's scientists gave up on cold fusion long ago, the U.S. Navy has continued work on the process. Its researchers have announced development of a reproducible cold fusion system

that consistently releases more energy than it consumes.

- According to the DOE's Energy Information Agency, shifting 20 percent of America's energy supply to renewable resources by 2020 would have almost no impact on the total cost of power. At present, less than 5 percent of the energy used in the United States comes from renewable resources.

Implications: Though oil will remain the world's most important energy resource for years to come, two or three decades forward it should be less of a choke point in the global economy.

Nuclear power will supply a growing portion of the world's energy needs. China intends to build 32 nuclear power plants by 2020. By 2025, there will be roughly 1,000 operating plants around the world. Russia alone hopes to export 60 nuclear plants to other countries by 2030.

Wind, solar, and geothermal power also will grow, but with much less impact on the world's energy supply and cost.

Declining reliance on oil eventually could help to reduce air and water pollution, at least in the developed world. By 2060, a costly but pollution-free hydrogen economy may at last become practical.

Fusion power remains a distant hope.

Cold fusion also remains a long shot for practical power, but FI believes it can no longer be discounted. If the Navy's reports of success prove correct, power plants based on the process could begin to come on line by 2030.

The Environment

22. People around the world are becoming increasingly sensitive to environmental issues as the consequences of neglect, indifference, and ignorance become ever more apparent.

- Pew Research Center reports that its 2007 Global Attitudes Project survey of 46 countries found much more concern for the environment than in the 2002 survey. In the United States, the number citing environmental problems as the top global threat rose from 23 percent to 37 percent. In India, the number went from 32 percent to 49 percent; in another survey of Indian concerns in the late 1990s, the environment had come in dead last. In both Japan and China, 70 percent of respondents said

environmental problems were the greatest global threat to the world.

- The health impacts of pollution are well established. In the United States alone, medical researchers estimate that some 64,000 people each year die from cardio-pulmonary disease as a result of breathing particulates. In sub-Saharan Africa, the toll is between 300,000 and 500,000 deaths per year. Pollution-related respiratory diseases kill about 1.4 million people yearly in China and Southeast Asia.
- None of India's 23 million-plus cities meets WHO air quality standards. Indoor smoke from cooking fires kills an estimated 500,000 people in India each year, mostly women and children.
- A 2004 report for the U.S. Environmental Protection Administration estimated that pollution by American power plants causes 23,600 needless deaths per year.
- In all, the World Health Organization estimates that 3 million people die each year from the effects of air pollution, about 5 percent of the total deaths annually.
- The European Parliament estimates that 70 percent of the Continent's drinking water contains dangerous concentrations of nitrate pollution.
- In the United States, there is growing concern that pollutants such as perchlorate, the gasoline additive MTBE, and even the chlorine used to kill water-borne pathogens may represent significant health concerns.
- Though some debate remains about the cause, the fact of global warming has become undeniable. At Palmer Station on Anvers Island, Antarctica, for example, the average annual temperature has risen by 3 to 4 degrees since the 1940s, and by an amazing 7 to 9 degrees in June—early winter in that hemisphere.
- Governments are taking more-active measures to protect the environment. After years of ineffective gestures, Costa Rica has incorporated about 25 percent of its land into protected areas, such as national parks. Cambodia has protected a million-acre forest. Gabon has set aside 10 percent of its land for parks. Liberia is protecting 155,000 acres of forest in an effort to safeguard endangered western chimpanzees. In 1999, Brazil raised the maximum fine for illegal logging.
- In an effort to promote cleaner energy technologies and to slow global warming, most European nations now tax carbon emissions or fossil fuels. In Germany, a

carbon tax raises the cost of gasoline by nearly 11 cents per gallon.

- Anticipating a three-foot rise in sea levels, the Netherlands is spending \$1 billion to build new dikes.

Implications: CO₂ will remain a problem for many years to come. If air pollution were halted instantly, it would take an estimated 200 years for carbon dioxide and other greenhouse gases to return to pre-industrial levels.

Recent analyses say there is a 90-percent chance that the planet's average annual temperature will rise between 3 and 9 degrees over the next century. This will cause severe dislocations both for plant and animal populations and for many human activities.

Environmental policies will provoke a political backlash wherever they conflict with entrenched interests, as they have long done in the American West. However, a solid majority of voters throughout the developed world now recognize the need to clean up the environment, and especially to control greenhouse warming. Throughout most of the world, polluters and private beneficiaries of public assets will increasingly confront restrictive regulations designed to serve the interests of the community at large.

23. Water shortages will be a continuing problem for much of the world.

- By 2040, at least 3.5 billion people will run short of water, almost 10 times as many as in 1995. By 2050, fully two-thirds of the world's population could be living in regions with chronic, widespread shortages of water.

- Contaminated water is implicated in 80 percent of the world's health problems. An estimated 40,000 people around the world die each day of diseases directly caused by contaminated water. That is more than 14 million per year.

- One-third of the population of Africa and most of the major cities in the developing world will face water shortages, according to the United Nations.

- The northern half of China, home to perhaps half a billion people, already is short of water. The water table under Beijing has fallen nearly 200 feet since 1965.

- Australia faces some of the most severe water shortages in the developed world. After a long drought, the Murray-Darling river system, which supplies water

for 40 percent of the country's crops and 80 percent of its irrigation, no longer carries enough water to reach the sea without constant dredging. Salinity levels in the Murray are rising so quickly that the water is expected to be undrinkable in 20 years.

- Water usage is causing other problems as well. For example, irrigation water evaporates, leaving minerals in the soil. By 2020, 30 percent of the world's arable land will be salty; by 2050, 50 percent. Salinization already is cutting crop yields in critical farming areas of India, Pakistan, Egypt, Mexico, Australia, and the United States.

- Pollution further reduces the supply of safe drinking water. In India, an estimated 300 million people lack access to safe drinking water, due to widespread pollution of rivers and groundwater.

- Water quality is a growing problem even in the developed lands. In the United States, cities such as Atlanta, where the delivery system is a century old and poorly maintained, suffer frequent water-main breaks, which suck dirt, debris, bacteria, and pollutants into the water supply.

- Many climatologists believe that global warming will make drought in the United States much more frequent—even the norm—west of the Mississippi River.

Implications: Such problems as periodic famine and desertification can be expected to grow more frequent and severe in coming decades.

Climate change is expected to reduce the flow of Australia's parched Murray River by a further 5 percent in 20 years and 15 percent in 50 years.

Water wars, predicted for more than a decade, are a threat in places like the Kashmir: Much of Pakistan's water comes from areas of Kashmir now controlled by India.

Other present and future water conflicts involve Turkey, Syria, and Iraq over the Tigris and Euphrates; Israel, Jordan, Syria, and Palestine over water from the Jordan River and the aquifers under the Golan Heights; India and Bangladesh, over the Ganges and Brahmaputra; China, Indochina, and Thailand, over the Mekong; Kyrgyzstan, Tajikistan, and Uzbekistan over the Oxus and Jaxartes rivers; and Ethiopia, Sudan, and at least six East African countries, including Egypt, which share the Nile.

Impurities in water will become an even greater problem as the population of the developed countries ages and becomes more susceptible to infectious diseases.

In the United States, repair of decayed water systems is likely to be a major priority for older cities such as New York, Boston, and Atlanta. Cost estimates for necessary replacement and repair of water mains range up to \$1 trillion.

24. Recycling has delayed the "garbage glut" that threatened to overflow the world's landfills, but the threat has not passed simply because it has not yet arrived.

- Americans now produce about 4.5 pounds of trash per person per day, twice as much as they threw away a generation ago. In 2005, they sent about 245 million tons of "municipal solid waste" to landfills. Seventy percent of U.S. landfills will be full by 2025, according to the EPA.

- Seattle, with one of the most effective recycling programs in the country, recycles about half of its solid waste.

- Japan expects to run out of space for industrial waste as soon as 2008 and for municipal solid waste by 2015.

- In London and the surrounding region, landfills will run out of room by 2012. Some 37 percent of municipal waste there is recycled, with a target of 45 percent by 2020.

- In some other regions, simply collecting the trash is a major problem. Brazil produces an estimated 240,000 tons of garbage daily, but only 70 percent reaches landfills. The rest accumulates in city streets, where it helps to spread disease.

- Recycling and waste-to-energy plants are a viable alternative to simply dumping garbage. The United States has more than 2,200 landfills. Europe, where recycling and energy conversion are much more common, gets by with 175.

Implications: Expect a wave of new regulations, recycling, waste-to-energy projects, and waste management programs in the U.S. and other countries in an effort to stem the tide of trash. In the U.S. it will of course begin in California, a jurisdiction often cited by policy forecasters as a bellwether of change.

State and local governments will tighten existing regulations and raise disposal prices in Pennsylvania, South Carolina, Louisiana, and other places that accept much of the trash from major garbage producers such as New York.

Trash producers in the developed world will ship much more of their debris to re-

positories in developing countries. This will inspire protests in the receiving lands.

Beyond 2025 or so, the developing countries will close their repositories to foreign waste, forcing producers to develop more waste-to-energy and recycling technologies. Ultimately, it may even be necessary to exume buried trash for recycling to make more room in closed dump sites for material that cannot be reused.

Waste-to-energy will make only a small contribution to the world's growing need for power.

25. Industrial development trumps environmental concerns in many parts of the world.

- The Pew study cited in Trend 22 found that less than one-fourth of respondents in any African country rated environmental problems as the world's most important threat. In Ethiopia, where desertification is at its worst and drought is a constant threat, only 7 percent did so.

- Beijing has made saving what is left of China's environment a national priority. Some 70 percent of the energy in China comes from coal-burning power plants, few of them equipped with pollution controls. As a result, respiratory diseases are epidemic. In addition, most rivers are so polluted that fish no longer live in them. Yet current development plans call for the construction of over 500 more coal-fired plants in the next ten years. Scientists estimate that by 2025 China will emit more carbon dioxide and sulfur dioxide than the United States, Japan, and Canada combined.

Implications: Broad regions of the planet will be subject to pollution, deforestation, and other environmental ills in the coming decades.

Acid rain like that afflicting the United States and Canada will appear wherever designers of new power plants and factories neglect emission controls. In India, an area the size of the United States is covered by a haze of sulfates and other chemicals associated with acid rain. Look for this problem to appear in most other industrializing countries.

Diseases related to air and water pollution will spread dramatically in the years ahead. Already, chronic obstructive pulmonary disease is five times more common in China than in the United States. As citizens of the developing countries grow to expect modern health care, this will create a grow-

ing burden on their economies.

This is just a taste of future problems, and perhaps not the most troublesome. Even the U.S. government now admits that global warming is a result of human activities that produce greenhouse gases. It now seems that China and India soon will produce even more of them than the major industrialized nations. Helping the developing lands to raise their standards of living without causing wholesale pollution will require much more aid and diplomacy than the developed world has ever been willing to give this cause.

26. Though species extinction may not be so rapid as once believed, loss of biodiversity will be a growing worry for decades to come.

- By 2100, as many as half of all species could disappear.

- Some 16,118 species are now listed as threatened (7,925 animal species and 8,393 plant and lichen species), according to the 2006 Red List of the International Union for Conservation of Nature and Natural Resources. This is an increase of nearly 2,700 in four years. The real list is likely at least twice as large, as the group has evaluated only 40,000 of the 1.5 million species on its list.

- Just 25 so-called "hot spots" covering 11 percent of the world's surface have lost 70 percent of their original vegetation. What is left in its natural state, about 2 percent of the planet's surface, is home to 44 percent of all plant species and 35 percent of all vertebrates other than fish. The hot spots also are home to 1.2 billion people, or one-fifth of the world's population.

- An estimated 50,000 species disappear each year, up to 1,000 times the natural rate of extinction, according to the United Nations Environmental Program.

- Eleven percent of birds, 25 percent of mammals, and 20 percent to 30 percent of all plants are estimated to be nearing extinction.

- The chief cause for species loss is the destruction of natural habitats by logging, agriculture, and urbanization. Some 30 million acres of rainforest are destroyed each year. More than half the world's rainforests are already gone. At current rates, the rest could disappear in the next 40 years.

- Amphibian populations are in decline throughout the world, for reasons that remain poorly understood.

- Coral reefs throughout the world are dying rapidly. Caribbean reefs have lost 80 percent of their coral cover in the past three decades. In Indonesia, home to one-eighth of the world's coral reefs, more than 70 percent of the reefs are dead or dying. Among the suspected culprits are overfishing, pollution, and global warming.

- Though commercial fishing is not known to have exterminated any species—largely because the last few members of a species are too costly to catch—it is turning out to be one more important cause of species depletion. Stocks of cod, tuna, swordfish, marlin, and sharks are down 90 percent since modern industrialized fishing began 40 years ago.

Implications: Species loss has a powerful negative impact on human well-being. Half of all drugs used in medicine are derived from natural sources, including 55 of the top 100 drugs prescribed in the United States. About 40 percent of all pharmaceuticals are derived from the sap of vascular plants. So far, only 2 percent of the 300,000 known sap-containing plants have been assayed for useful drugs.

The Indonesian economy loses an estimated \$500,000 to \$800,000 annually per square mile of dead or damaged reef.

Australia may lose even more as degradation of the Great Barrier Reef continues.

Diverse ecosystems absorb more carbon dioxide than those with fewer species. Loss of biodiversity thus is a potential cause of global warming.

27. Continuing urbanization will aggravate most environmental and social problems.

- Forty-eight percent of the world's population currently lives in cities, according to the Population Reference Bureau's 2006 *World Population Data Sheet*. By 2030, that will figure grow to 60 percent, as some 2.1 billion people are added to the world's cities.

- More than three-fourths of the population in developed countries live in cities. In North America, urbanization is the highest, at 79 percent. But cities are growing fastest in the developing world.

- The big are getting bigger. In 1950, there were just eight megacities, with populations exceeding 5 million, in the world. By 2015, there will be 59 megacities, 48 of them in less developed countries. Of these, 23 will have populations over 10 million,

all but four in the developing lands.

- On average, natural increase now accounts for more than half of population growth in the world's cities; at most, only a little more than one-third of urban growth results from migration.
- Up to 1 billion city dwellers lack adequate shelter, clean water, toilets, or electricity. The United Nations estimates that these problems cause 10 million needless deaths annually.
- Fuels burned in cities account for 75 percent of global carbon emissions from human activity, according to the World-watch Institute.
- NASA scientists point out that urbanization also tends to put buildings and blacktop on the most fertile land, eliminating significant quantities of carbon-absorbing plants.
- Urbanization also deprives surrounding areas of water: Instead of sinking into the ground, rain is collected, piped to the city, used, treated as gray water, and then discarded into the nearest river or ocean. In some regions, such as near Atlanta, water levels in local aquifers are declining rapidly because the water that once replenished them now is lost.
- The United States is the one major exception to the global trend toward urbanization. This automobile-reliant society built one of the best highway systems in the world and has relatively little mass transit, so more Americans live in the suburbs than in the cities.

Implications: Cities' contribution to global warming can only increase in the years ahead.

As the world's supply of potable water declines, people are concentrating in those areas where it is hardest to obtain and is used least efficiently. This trend will aggravate water problems for so long as it continues.

Many more people will die due to shortages of shelter, water, and sanitation in the mega-cities of the developing world. Epidemics will become still more common as overcrowding spreads HIV and other communicable diseases more rapidly.

Since urban growth is now due more to natural increase than to migration, programs designed to encourage rural populations to remain in the countryside may be misplaced. Education and family planning seem more likely to rein in the growth of cities.

Technology

28. Technology increasingly dominates both the economy and society.

- New technologies are surpassing the previous state of the art in all fields, and technological obsolescence is accelerating.
- For most users, computers have become part of the environment, rather than just tools used for specific tasks. With wireless modems, portable computers give us access to networked data wherever we go. Internet-equipped cell phones are even more convenient for access to e-mail and some Web sites.
- Robots are taking over more and more jobs that are routine, remote, or risky, such as repairing undersea cables and nuclear power stations. Flexible, general-service personal robots will appear in the home by 2015, expanding on the capabilities of devices such as robotic vacuum cleaners and lawn mowers.
- By 2015, artificial intelligence, data mining, and virtual reality will help most companies and government agencies to assimilate data and solve problems beyond the range of today's computers. AI applications include robotics, machine vision, voice recognition, speech synthesis, electronic data processing, health and human services, administration, and airline pilot assistance.
- Superconductors operating at economically viable temperatures will be in commercial use soon after 2015.

Implications: New technologies should continue to improve the efficiency of many industries, helping to keep costs under control. However, this increased productivity has retarded U.S. job creation since at least 2002. Other developed countries are likely to feel the same effect in the future.

Technology made international outsourcing possible. It will continue to promote outsourcing, to the benefit of the recipient countries, but causing painful job losses in the donor lands.

New technologies often require more education and training to use them effectively. They also provide many new opportunities to create businesses and jobs.

Automation will continue to cut the cost of many services and products, making it possible to reduce prices while still improving profits. This will be critical to business survival as the Internet continues

to push the price of many products to the commodity level.

New technology also will make it easier for industry to minimize and capture its effluent. This will be a crucial ability in the environmentally conscious future.

Key technologies for 2020, as forecast by Battelle Institute:

Gene-based medical care, from custom-tailored pharmaceuticals to cloned organs for transplantation;

High-powered energy packages such as advanced batteries, cheap fuel cells, and micro-generators;

"Green integrated technology" to eliminate manufacturing waste and make products completely recyclable;

Omnipresent computing with computers built into consumer products, clothing, and even implanted under the skin;

Nanomachines measured in atoms rather than millimeters that do everything from heating and cleaning our homes to curing cancer;

Personalized public transportation that integrates out cars into a coordinated transport network, automatically picking the fastest routes and bypassing traffic jams;

Designer foods and crops genetically engineered to resist disease and pests and be highly nutritious;

Intelligent goods and appliances such as telephones with built-in directories and food packaging that tells your stove how to cook the contents;

Worldwide inexpensive and safe water from advanced filtering, desalination, and perhaps even extraction from the air;

And super senses that use implants to give us better hearing, long-distance vision, or the ability to see in the dark.

29. Research and development play a growing role in the economy.

- Total U.S. outlays on R&D have grown steadily in the past three decades. In 2006, the U.S. spent about \$330 billion on R&D.

- China has taken second place in the world's R&D spending, with a budget estimate at \$136 billion in 2006, up from \$60 billion in 2001. Still more spending may be hidden in military budgets. China says it will raise its R&D spending from about 1.23 percent of GDP in 2004 to 2.5 percent in 2020.

- In Japan, outlays for research and development have risen almost continuously, to nearly 3 percent of GDP. In 2006, Japan

spent about \$130 billion on R&D.

- R&D spending in the European Union (EU-15) amounted to \$230 billion in 2006, about 1.9 percent of GDP. The European Commission has set a goal of raising R&D spending to 3 percent of GDP by 2010.

- In Russia, R&D funding is roughly 1.5 percent of GDP, up from just 0.7 percent in 1997. This amounted to about \$26.25 billion in 2006. The Russian government funds around 60 percent of research in the country. About 44 percent of Russia's R&D budget goes to defense research, 10 percent to space. These figures omit whatever clandestine military research escapes notice.

- Corporate R&D in the United States has shifted in the post-September 11 period, with less emphasis on pharmaceuticals and computer-related fields and more focus on biotechnology, nanotechnology, and security technologies.

- Western corporations are outsourcing a growing fraction of their R&D to foreign contractors, just as they do other functions. Much of this work goes to India, some to Russia, but the growth area is China.

Implications: The demand for scientists, engineers, and technicians will continue to grow, particularly in fields where research promises an immediate business payoff.

Low-wage countries such as China once took only poorly paid routine jobs from advanced industrialized countries such as the United States. Today higher-paid jobs in science, technology, and the professions also are at risk.

Countries like India, China, and Russia once suffered a brain drain as those with high-tech skills emigrated to high-demand, high-wage destinations. Today, many students and professionals spend time in the West to learn cutting-edge skills, and then return to their native lands to work, start companies, and teach. This trend promotes the growth of some developing countries while reducing the competitive advantages of the developed world.

30. The United States is ceding its scientific and technical leadership to other countries.

- "The scientific and technical building blocks of our economic leadership are eroding at a time when many other nations are gathering strength," the National Academy of Sciences warns. "Although many people assume that the United States will always

be a world leader in science and technology, this may not continue to be the case inasmuch as great minds and ideas exist throughout the world. We fear the abruptness with which a lead in science and technology can be lost—and the difficulty of recovering a lead once lost, if indeed it can be regained at all."

- Measured as a percentage of the total federal budget or as a fraction of the U.S. GDP, government research funding has been shrinking for some 15 years. In 2005, the U.S. spent about 2.68 percent of its GDP on R&D, down from 2.76 percent in 2001.

- Washington has often reduced the post-inflation buying power of its R&D funding request. In the FY 2007 budget, for the first time, it cut R&D funds in absolute dollars as well. This year, the funding request for R&D totaled about \$137 billion, down about 1 percent from FY 2006. Some areas were harder hit. The National Science Foundation lost 3.2 percent of its previous budget; the National Institute of Science and Technology lost 6 percent. Some programs funded by the Federal Energy Efficiency and Renewable Energy Office lost 18 percent.

- Military research now absorbs much of the money that once supported basic science. Since 2000, U.S. federal spending on defense research has risen 7.4 percent per year, compared with only 4.5 percent for civilian research. In 2006, 59 percent of U.S. federal research funding went to defense projects. Of that, an estimated 40 percent went to "earmarks," congressional pet projects of doubtful value.

- The Defense Advanced Research Projects Agency has been legendary for its support of "blue sky" research that led to dramatic technical advances, including the creation of the Internet. Today it focuses increasingly on immediate military needs and low-risk development efforts.

- Washington's neglect of basic science is being felt in many ways. Only half of American patents are granted to Americans, a number that has been declining for decades. Only 29 percent of the research papers published in the prestigious *Physical Review* in 2003 were by American authors, down from 61 percent in 1983. As other countries become more skilled in critical high-tech fields, the United States is fast losing its edge.

- More than half of American scien-

tists and engineers are nearing retirement. At the rate American students are entering these fields, the retirees cannot be replaced except by recruiting foreign scientists.

- Between 25 percent and 30 percent of high school graduates who enter college plan to major in science or engineering. Fewer than half of them receive a degree in those fields.

- The number of U.S. bachelor's degrees awarded in engineering in 2005 was nearly 15 percent below the peak 20 years earlier. The U.S. needs 114,000 engineering graduates each year, according to the Department of Labor. According to most reports, it graduates about 65,000. (Some analysts put the number higher by including "engineering-equivalent" courses such as computer science, which others do not count.) According to the National Academy of Engineering, the United States produces only about 7 percent of the world's engineers.

- Only 6 percent of American undergraduates are engineering majors. In Europe, the number is 12 percent; in China, it is 40 percent.

- Of the doctoral degrees in science awarded by American universities, about 30 percent go to foreign students. In engineering, it is 60 percent.

- By inhibiting stem-cell research, cloning, and other specialties the United States has made itself less attractive to cutting-edge biomedical scientists. The United Kingdom is capitalizing on this to become the world's leader in stem-cell research. In the process, it is reversing the brain drain that once brought top British scientists to the U.S. More than 70 leading American biomedical researchers have moved to the U.K. along with many less noted colleagues. Latin America also has been receiving scientific emigrés from the U.S.

- Since post-9/11 immigration restrictions were enacted, the number of foreign students taking the Graduate Record Exam has declined sharply. Applications were off by 50 percent from China, 37 percent from India, 15 percent from South Korea, and 43 percent from Taiwan as of 2004. Though recovering slowly, their numbers remain depressed. Instead of building relationships in the U.S.—professional loyalties that could contribute to American science and technology—they will form their attachments to its competitors.

- This is significant. About 25 percent of America's science and engineering work-

force are immigrants, including nearly half of those with doctoral degrees. During the 15 years ending in 2007, one-third of the American scientists receiving Nobel Prizes were foreign-born.

- According to Purdue president Martin Jischke, by 2010 more than 90 percent of all scientists and engineers in the world will live in Asia.

Implications: The Bureau of Labor Statistics predicts that the number of job openings in science and engineering will grow by 47 percent in the five years ending 2010—three times as fast as non-technical fields. The U.S. will not produce nearly enough home-grown technical specialists to fill them.

Demand to import foreign scientists and engineers on H-1B visas also will continue to grow.

Publicity about this, and about the offshoring of R&D to company divisions and consulting labs in Asia, in turn will discourage American students from entering technical fields. This has already been blamed for shrinking student rolls in computer science.

If this trend is not reversed, it will begin to undermine the U.S. economy and shift both economic and political power to other lands. According to some estimates, about half of the improvement in the American standard of living is directly attributable to research and development carried out by scientists and engineers.

- ◆ In 2005, China for the first time exported more IT and communications goods (\$180 million) than the United States (\$145 million.) Its lead has grown each year since then.

31. Advances in transportation technology and practice will make travel and shipping faster, cheaper, and safer, by land, sea, and air.

- The newest generation of aircraft, such as the Boeing 787 and future Airbus A350 XWB, are using lightweight materials and more efficient engines to cut fuel costs, stretch ranges, and increase cargo capacity.
- The airline industry is developing technical advances such as satellite navigation and communications, runway collision avoidance systems, safer seat design, and flash-resistant fuels.

- ◆ EWGPS compares an aircraft's GPS location with digital topographic maps to warn when a plane is in danger

of flying into terrain. No plane equipped with it has ever had this kind of crash.

- Rail travel is getting faster. The new TGV Est line, which runs 300 km (180 miles) from Paris to Frankfurt, operates at 320 kph (198.8 mph) inside France, compared with 300 kph on other parts of the TGV system.

- Advances in automobile technology such as road-condition sensors, continuously variable transmissions, automated traffic management systems, night-vision systems, and smart seats that tailor air-bag inflation to the passenger's weight are reaching the marketplace.

- The first commercial hybrid gas-electric cars are available already, with more scheduled for future model years.

Implications: One of the fastest-growing transport industries is trucking, thanks to the growth of just-in-time inventory management and Internet-based companies that rely on trucks to deliver their products. This field will grow more efficient as GPS-based truck tracking, RFID-based cargo management, more efficient engines, and other new technologies spread through the industry.

To reduce the number and severity of traffic accidents, trucks on the most heavily used highways will be exiled to car-free lanes, and the separation will be enforced.

New hybrid car models will begin to gain significant market share from traditional gas guzzlers between 2010 and 2015.

Following European practice, even "legacy" air carriers in the U.S. will begin to replace the spokes of their existing hub-and-spokes system with high-speed trains for journeys of 100 to 150 miles.

By 2015, improved technologies and growing concerns about the long-term cost of energy will lead even the rail-resistant United States to begin modernizing its train system.

New aircraft navigation and safety technologies will reduce the number and severity of crashes.

By 2010, smart-car technologies will begin to reduce deaths due to auto accidents in Europe and, a few years later, the U.S.

Cities increasingly will struggle to reduce auto congestion. Some will limit the use of private automobiles, as in Munich, Vienna, and Mexico City. Others will tax auto use in congested areas, as is done in London and proposed in New York City. Most also will encourage the development

and use of mass transit, as in Copenhagen and Curitiba, Brazil.

Technology may offer other alternatives. One proposal is "dual-mode transportation," in which private cars could be driven normally on short hauls but would run on automated guideways for long-distance travel.

32. The pace of technological change accelerates with each new generation of discoveries and applications.

- The design and marketing cycle—idea, invention, innovation, imitation—is shrinking steadily. Thus, products must capture their market quickly, before the competition can copy them. As late as the 1940s, the product cycle stretched to 30 or 40 years. Today, it seldom lasts 30 or 40 weeks.

- Almost any new consumer product can be exactly duplicated by Chinese factories and sold on e-Bay within a week after it is introduced.

- Eighty percent of the scientists, engineers, technicians, and physicians who ever lived are alive today—and exchanging ideas real time on the Internet.

- In fast-moving engineering disciplines, half of the cutting-edge knowledge learned by college students in their freshman year is obsolete by the time they graduate.

Implications: All the technical knowledge we work with today will represent only 1 percent of the knowledge that will be available in 2050.

Industries will face much tighter competition based on new technologies. Those who adopt state-of-the-art methods first will prosper. Those who ignore them eventually will fail.

Brand names associated with quality are becoming even more important in this highly competitive environment.

Lifelong learning is a necessity for anyone who works in a technical field—and for growing numbers who do not.

33. Important medical advances will continue to appear almost daily.

- Genetic research has accelerated advances in medicine and in the growth of medical knowledge. Early results include possible cures for hemophilia, cystic fibrosis, familial hypercholesterolemia, a number of cancers, and AIDS. Eventually, some 4,000 hereditary disorders may be prevented or cured through genetic intervention.

- ◆ At Sangamo Biosciences, in California, researchers have experimented with rewriting the patient's own DNA, rather than replacing it, to correct hereditary errors. The technique seems to do away with some of the problems of conventional genetic techniques and may lead to practical therapies sooner than gene splicing.

- ◆ Also in the works: a new generation of gene-based diagnostic tests that may identify cancer early and tell which drugs are most likely to benefit individual patients with heart disease, cancer, and other ills.

- A process called RNA interference, which deactivates individual genes, is quickly revealing the functions of individual genes. It also may be used to disable disease-causing genes, perhaps making it possible to cure cancer, viral ills, and hereditary disorders like Huntington's chorea and amyotrophic lateral sclerosis. One potential cure for HIV/AIDS is expected to be ready for human testing by 2010.

- Growing knowledge of biochemistry, aided by advanced computer modeling, has made it possible to design drugs that fit specific receptors in the cell. Drugs created through this technology often are much more effective than natural derivatives.

- ◆ Almost 400 anticancer compounds are being tested in people, almost all of them "designer drugs" intended to minimize side effects. In 1995, only ten anticancer drugs were being tested, most of which had severe side effects.

- Outside the United States, brain-cell and nerve-tissue transplants to aid victims of retardation, head trauma, and other neurological disorders will enter clinical use by 2012. Laboratory-grown bone, muscle, and blood cells also will be employed in transplants.

- Other transplanted tissues come from cloning and related technologies used to grow stem cells. Radical new treatments for diabetes, Parkinson's disease, perhaps Alzheimer's, and many other disorders are can be expected to arrive within the next five to ten years. Embryonic stem cells have already been found to repair damaged heart muscle.

- ◆ Scientists at Wistar Institute, in Philadelphia, have found a strain of mice that can regrow severed limbs and damaged organs, including heart muscle. Liver cells injected into other mice

enable the recipients to regenerate for at least six months.

- Brown fat, found in many animals and in human babies, is converted almost immediately to body heat; it does not cause obesity. White fat, in adult humans, goes straight to the waste and other bulging body parts. Now scientists at Boston's Dana-Farber Cancer Institute have found the gene controlling brown fat production, perhaps opening the way to end the developed world's epidemic of obesity.

- Surgeons working via the Internet can now operate on patients in remote areas, using experimental robot manipulators to handle their instruments.

- Nanotechnology research is beginning to produce medically useful products, such as nanoparticles that can carry medication into the cell. Much more complicated devices for both diagnosis and treatment are in the concept stage.

Implications: In the next 10 years, we expect to see more and better bionic limbs, hearts, and other organs; drugs that prevent disease rather than merely treating symptoms; and body monitors that warn of impending trouble. These all will reduce hospital stays.

Expect also the first broadly effective treatments for viral diseases, experimental regeneration of lost or damaged human tissues, and effective ways to prevent and correct obesity.

By 2025, the first nanotechnology-based medical therapies should reach clinical use. Microscopic machines will monitor our internal processes, remove cholesterol plaques from artery walls, and destroy cancer cells before they have a chance to form a tumor.

Forecasting International believes that cloning and related methods will be accepted for the treatment of disease, though not to produce identical human beings.

Even without dramatic advances in life extension, Baby Boomers are likely to live much longer, and in better health, than anyone now expects. However, this trend could be sidetracked by the current epidemic of obesity, which threatens to raise rates of hypertension, diabetes, heart disease, and arthritis among Boomers, if a cure is not found quickly enough.

High development and production costs for designer pharmaceuticals, computerized monitors, and artificial organs will continue to push up the cost of health care

far more rapidly than the general inflation rate. Much of these expenses will be passed on to Medicare and other third-party payers.

Severe personnel shortages can be expected in high-tech medical specialties, in addition to the continuing deficit of nurses.

A growing movement to remove barriers to stem-cell research in the United States could speed progress in this critical field. This could be expected to produce new treatments for neurological disorders such as Parkinson's and Alzheimer's disease and many other illnesses now incurable or untreatable. It also would recover one aspect of America's lost lead in science.

34. The Internet continues to grow, but at a slower pace.

- In mid-2007, Internet users numbered about 1.173 billion, up just less than one-fourth in three years.

- Most of growth is now taking place outside the United States, which is home to only 19 percent of Net users. U.S. Net users now account for about 75 percent of the American population, a figure that has only crept higher for several years.

- When it comes to percentage of broadband users, the United States ranks only 15th among the developed lands and 24th over all. About 47 percent of American Net users have broadband service, compared with 90 percent in South Korea.

- ◆ Americans also get poorer service, paying about \$35 per month for download speeds of 1.5mbps and only 256kbps upload speeds. Japanese Net users pay about the same for 50mbps service.

- In mid-2007, the most recent available data showed 162 million Net users in China (12.3 percent of the population), 42 million in India (3.7 percent), and 86.3 million in Japan (67.1 percent.)

- Internet penetration is lagging badly in Africa, where only 3.6 percent of the population is online. Most Net users are in the North African countries or in the republic of South Africa. In between, Net connections are scarce.

- In mid-2007, there were 2.66 billion IP addresses—very roughly equivalent to Web sites—on the Internet. Of these, nearly 1.4 billion were in the United States, 251 million in the U.K., 154 million in Japan, and 116 million in China.

- Analysts believe that Net growth will not accelerate again until broadband ser-

vice becomes less expensive and more widely available.

- E-commerce is still growing, but not as quickly as it once did. In the U.S., total retail sales in the first quarter of 2007 came in at about \$999.5 billion, Internet retail sales at \$31.5 billion, just 3.2 percent of the total and growing by only 0.1 percent of the total for the last three quarters. Total Internet sales are expected to reach \$116 billion for the year. Sales growth, as much as 25 percent per year in 2004, is expected to slow to 9 percent annually by 2010.

- Not long ago, the Internet was predominately English-speaking. In mid-2007, English and “Chinese” (we assume this combines mainland Mandarin, Taiwanese Mandarin, and Cantonese) were tied at 31.7 percent of Internet users. More than 5 percent of Netizens spoke Spanish, Japanese, German, or French.

Implications: B2B sales on the Internet are dramatically reducing business expenses throughout the Internet-connected world, while giving suppliers access to customers they could never have reached by traditional means.

The Net has made it much easier and cheaper to set up a profitable business. An online marketing site can be set up with just a few minutes’ work at a cost of much less than \$100. This is fostering a new generation of entrepreneurs.

Internet-based outsourcing to other countries has only just begun. Growth in this field will accelerate again as overseas service firms polish their English, French, and German and find even more business functions they can take on.

Cultural, political, and social isolation has become almost impossible for countries interested in economic development. Even China’s attempts to filter the Internet and shield its population from outside influences have been undermined by hackers elsewhere, who provide ways to penetrate the barriers.

35. Advanced communications technologies are changing the way we live and work.

- The Internet is as much a communications medium as it is an information resource.

- However, Millennials already have abandoned e-mail for most purposes other than communicating with “clueless” parents and grandparents. Most have adopted

instant messaging and social-network Web sites to communicate with their peers.

- Telecommuting is a growing rapidly, thanks largely to e-mail and other high-tech forms of communication. About 80 percent of companies worldwide now have employees who work at home, up from 54 percent in 2003. The number of telecommuters in the United States reached an estimated 20 million in 2006.

- ♦ AT&T says that 90 percent of its employees do some work away from the office, while 41 percent work at home one or two days a week. This saves the company \$180 million a year.

- “Podcasting”—recording college lectures, news stories, business reports, and the like for playback on the Apple iPod—allows users to listen at their convenience.

- Improved communications is a major goal of many government agencies today, particularly in law enforcement and disaster services, which need to coordinate the activities of many different agencies under emergency conditions.

Implications: E-mail promised to speed business. Instead, it absorbs more time than busy executives can afford to lose. Expect the nascent reaction against e-mail to grow as many people eliminate mailing lists, demand precise e-communications rather than open-ended conversation, and schedule only brief periods for dealing with mail.

Instant messaging is likely to be even more destructive of time and concentration for the under-30 set.

However, e-mail is a major contributor to globalization and outsourcing, because it eliminates many of the obstacles of doing business across long distances and many time zones.

Unfortunately, e-mail and other modern communications techniques also have made possible a variety of crimes, from online fraud to some forms of identity theft.

They also have made it much easier for international terrorist organizations to coordinate their activities.

Labor Force and Work

36. Specialization continues to spread throughout industry and the professions.

- For doctors, lawyers, engineers, and other professionals, the size of the body

of knowledge required to excel in any one area precludes excellence across all areas.

- The same principle applies to artisans. Witness the rise of post-and-beam home-builders, old-house restorers, automobile electronics technicians, and mechanics trained to work on only one brand of car.

- Modern information-based organizations depend on teams of task-focused specialists.

- Globalization of the economy calls for the more independent specialists. For hundreds of tasks, corporations increasingly turn to consultants and contractors who specialize more and more narrowly as markets globalize and technologies differentiate.

Implications: This trend creates endless new niche markets to be served by small businesses.

It also brings more career choices, as old specialties quickly become obsolete, but new ones appear even more rapidly.

This is a major driver for the Trend 37.

37. Education and training are expanding throughout society.

- Of roughly 240 job categories classified by the U.S. Bureau of Labor Statistics to experience high growth from 2004 through 2010, 86 require a college degree, while 70 more require at least some college education. All the rest call for work experience in a related field; on-the-job training, often for long periods; or a postsecondary vocational degree.

- American public schools face an extreme teacher shortage. Some 40 percent of teachers say they will leave the profession within five years. In 2006, a poll found that half of all high-school teachers expected to leave by 2010.

- American schools will add 93,000 new teaching positions between 2004 and 2014, according to the federal Bureau of Labor Statistics. However, the need to replace teachers leaving the profession will mean that 169,000 job openings for teachers must be filled each year.

- Knowledge turnover in the professions is a growing challenge that will require continuous retraining and lifelong learning. The half-life of an engineer’s knowledge today is only five years; in 10 years, 90 percent of what an engineer knows will be available on the computer. In electronics, fully half of what a student learns as a freshman is obsolete by his senior year.

- Rapid changes in the job market and work-related technologies will necessitate increased training for virtually every worker.

- In the next 10 years, close to 10 million jobs will open up for professionals, executives, and technicians in the highly skilled service occupations.

- A substantial portion of the labor force will be in job retraining programs at any moment. Much of this will be carried out by current employers, who have come to view employee training as a good investment.

- Schools will train both children and adults around the clock. The academic day will stretch to seven hours for children; adults use much of their remaining free time to prepare for their next job.

- We already are seeing a trend toward more adult education. One reason is the need to train for new careers as old ones are displaced or Boomers grow bored with them. The other is the need of healthy, energetic people to keep active during retirement.

- ◆ Nearly half of Americans ages 25 and older—92 million people—take part in some form of continuing education.

- In the United States, education is moving rapidly to the Internet, as small, rural grammar and high schools supplement their curricula with material from larger institutions, while universities increasingly market their programs to distant students.

- In order to give those who cannot attend their classes a chance to educate themselves, the Massachusetts Institute of Technology has put its entire curriculum on the Internet, including class notes, many texts, and sometimes videos of classroom lectures. Other institutions are following suit.

- In Mexico, the entire curriculum for 10- and 11-year-olds has been digitized. Some 5 million students now receive all their instruction via the *Enciclomedia*, a computer system that projects any of 20,000 images, videos, and even commercial movie clips onto an electronic screen. Teachers act largely as managers for the teaching system. The goal is to improve educational quality, and teachers report that children pay closer attention and learn more than in traditional classrooms.

- ◆ Delegations from India, China, and even the U.S. have visited Mexico to evaluate the *Enciclomedia* for possible use at home.

Implications: In knowledge-based economies, a region's growth prospects depend on its ability to generate and use innovation. This correlates roughly with the number of college-educated adults living there. Throughout the industrialized countries, this gives cities an advantage over rural and suburban areas. It is one reason upwardly mobile adults tend to move to the cities.

Skills are the most important factor in economic success today. Unfortunately, the people who need them most, the poor and unemployed, cannot afford schooling and therefore are least able to obtain them. Compensating for this is a natural role for the national government.

Even small businesses must learn to see employee training as an investment, rather than an expense. Motorola estimates that it reaps \$30 in profits for each dollar it spends on training.

Both management and employees must get used to the idea of lifelong learning. It will become a significant part of work life at all levels.

As the digital divide is erased and minority and low-income households buy computers and log onto the Internet, groups now disadvantaged will be increasingly able to educate and train themselves for high-tech careers.

38. Services are the fastest-growing sector of the global economy.

- Service industries provide 79 percent of the GDP in the United States, 77 percent in France, 74 percent in Britain, 73 percent in Japan, and 70 percent in Germany. In each case, services are growing rapidly, other sectors less so.

- Service industries account for about 77 percent of private nonfarm employment in the United States, up from only 70 percent in 1990. In the decade ending in 2010, services are expected to account for the entire net gain in U.S. employment.

- In Britain, services provide 74 percent of jobs; in France, 72 percent; in Japan, 68 percent; in Germany, 64 percent. In each case, the percentage of service employment is rising.

- In the decade ending in 2014, the fastest job growth, both in raw numbers and as percentages, will be in technical and professional occupations, according to the U.S. Bureau of Labor Statistics. Computer specialties, teaching, engineering, and sim-

ilar fields will add 6 million new positions, more than 21 percent of the 19 million new jobs expected for the period.

- Production and less skilled jobs, in contrast, are disappearing. By 2014, the United States is expected to have more chief executives than machine tool operators, more lawyers than farm workers.

- Service jobs have replaced many of the well-paid positions lost in manufacturing, transportation, and agriculture. These new jobs, often part time, pay half the wages of manufacturing jobs. On the other hand, computer-related service jobs pay much more than the minimum—for workers with sound education and training.

- In raw numbers, the fastest job growth is in of the least-skilled occupations, such as cashiers and retail sales.

Implications: Services are now beginning to compete globally, just as manufacturing industries have done over the last 20 years. By creating competitive pressure on wages in the industrialized lands, this trend will help to keep inflation in check.

The growth of international business will act as a stabilizing force in world affairs, as most countries find that conflict is unacceptably hard on the bottom line.

39. Women's salaries are approaching equality with men's—but very slowly.

- In the 1980s and '90s, women's overall income in the United States was catching up with that of their male co-workers. More recently, it has stagnated.

- ◆ In 1995, university educated women earned 75.7 cents for every dollar earned by men, on average. In 2005, it had fallen to 74.7 cents.

- ◆ During the same period, lower-income women continued to gain on their male peers, though very slowly.

- ◆ One reason may be that women are less interested than men in working 70 hours or more per week during their prime reproductive years, and growing numbers have chosen to stay home and rear their children. This may reflect the scarcity of child care services in the U.S.

- ◆ Women also appear to be less likely to choose and pursue a career on the basis of income. In one recent survey, 60 percent of employed mothers preferred part-time work, though only 24 percent actually worked part-time.

- Studies that attempt to compensate

for differences in factors such as education, occupation, experience, and union membership find much smaller differences. One reports that women receive about 91 percent as much as men. Another held that incomes are virtually equal when measured with appropriate rigor.

- Some studies also suggest that the pay gap has largely disappeared for women in the newest cohort of workers. This would make sense, given the nearly total gender blindness of the Millennials.

- According to the European Commission, women on the Continent earn 15 percent less than men, on average, down from 17 percent in 1995. In Germany, the pay difference has actually grown 1 percent over the period, to 22 percent. In Britain, the gap was 20 percent, down from 26 percent.

- ♦ Note that the U.K. itself reports a pay gap of only 17 percent in 2006, based on average hourly salary. However, women's net weekly earnings were lower because they are paid for fewer hours each week than men are.

- Women's salaries have reached parity with men's in only five fields, nearly all of them areas where women have broken into trades long dominated by men: hazardous material removal workers, telecommunications line installers and repairers, meeting and convention planners, dining room or cafeteria workers, and construction trade helpers.

Implications: The fact that women's salaries are lagging despite higher academic achievement than men suggests that many college-educated women may be underemployed. Whether this is by their choice or occurs for some other reason has yet to be determined.

More new hires will be women, and they will expect both pay and opportunities equal to those of men.

Women's average income could exceed men's within a generation. College graduates enjoy a significant advantage in earnings over peers whose education ended with high school. In the U.S., some 65 percent of young men and women enroll in college after high school, but women are more likely to graduate. About 58 percent of college graduates are women.

To the extent that experience translates as prestige and corporate value, older women should find it easier to reach upper-management positions. This will blaze the

trail and help raise the pay scale for women still climbing the corporate ladder.

Competition for top executive positions, once effectively limited to men, will intensify even as the corporate ladder loses many of its rungs.

The glass ceiling has been broken. One-fourth of upper executives today, and nearly 20 percent of corporate board members, are women—far more than in any previous generation. Look for more women to reach decision-making levels in government and business.

40. The traditional age of retirement is losing its significance.

- OECD data show that people are retiring well before age 65 in the developed world. In 2004, less than 60 percent of the 54-60 age group in the OECD countries had a job. This varied from 50 percent in the earliest-retiring nations to 76 percent in the latest.

- According to Pew Research, as of 2006 the average American worker planned to retire at age 61 but actually did so at 57.8.

- These "retirements" may not be permanent. Americans in particular often return to work and delay complete retirement for several years. One in five people, and 40 percent of seniors, say they plan to continue working until they die.

- ♦ A study by Putnam Investments found that one-third of Americans who retire are back on the job two years later, usually in the same kind of job they left and at the same level of responsibility. Though two-thirds said they had returned to work out of choice, this decision may reflect economic need. Some 60 percent still carried a mortgage, and few had much in the way of savings or investments.

- ♦ The Bureau of Labor Statistics reports that the percentage of men and women still working at age 55 and above has been rising steadily since 1993. From age 62 to 64, more than half of men and 40 percent of women continue to work. At age 75 and above, 13.5 percent of men and 7.1 percent of women are still employed.

- In a recent poll, 70 percent of American Baby Boomers said they expected to continue working into their 70s—not because they could not afford to retire, although many are likely to find themselves short of funds, but because they could not

stand to be both healthy and inactive.

- ♦ Yet nearly two-thirds doubt that retirement is possible for anyone with only a middle-class income.

Implications: Since the penalty on earnings of Social Security recipients was rescinded, more American retirees will return to work, and those not yet retired will be more likely to remain on the job.

This trend will spread to other industrialized countries as the retirement-age population grows and the number of active workers to support them declines.

People increasingly will work at one career, "retire" for a while (perhaps to travel) when they can afford it, return to school, begin another career, and so on in endless variations. True retirement, a permanent end to work, will be delayed until very late in life.

By 2015, we expect the average retirement age in the United States to be delayed well into the 70s. Benefits may also continue to decline, and they will be given based on need, rather than as an entitlement.

Even though the Social Security program has been the "third rail" of American politics, within five years, the retirement age will be moved back at least to 70 for early retirement and full benefits at 72.

Older workers will partially make up for shortages of entry-level employees. The chance to remain in the workplace will reduce the risk of poverty for many elderly people who otherwise would have had to depend on Social Security to get by.

Retirees will act as technical aides to teachers, especially in the sciences, where schools are particularly desperate for help.

In the long run, it may prove impossible to maintain the practice of retirement, except by personal savings and investment.

41. Labor unions are losing their power to secure rights for workers and to shape public policy for workplace issues.

- Union membership has been falling for the past two decades. In the United States, some 20 percent of workers were union members in 1983. In 2006, just 12.0 percent of employed wage and salary workers were union members, down from 12.5 percent a year earlier.

- Public-sector workers in the United States are nearly five times as likely to be unionized than private-sector employees. Local government workers had the highest rate of union membership, nearly 42

percent. Financial activities had the fewest union members, just 1.9 percent.

- In South Korea, where organized labor once was invincible, no more than 11 percent of workers are union members.
- In Britain, where the Thatcher government broke union power in the 1980s, union membership has declined almost continuously, to 28.4 percent in December 2006.
- One reason for this decline is that companies are freely seeking and finding non-unionized workers around the world. They also contract out a growing proportion of business activities to nonunion firms.
- Increased automation can cut a company's work force by up to one-third. The surviving workers tend to be technicians and other comparatively well-educated semi-professionals, who always have tended to resist union membership.
- Globalization has done even more to strip unions of their power. Workers in the developed lands now compete directly with low-wage workers in the developing countries. Unions are forced to accept concessions from management or see their jobs go overseas.

Implications: For large companies, this trend promises continued stability in employee wages and benefits.

Unions eager to regain their membership will target any substantial industry or firm with less-skilled employees to organize. This could raise labor costs for companies that unions once would have considered too small to organize.

In ten to 15 years, American labor unions will compete with AARP to lead the battle for the rights of late-life workers and for secure retirement benefits. They face an inherent conflict between the interests of workers in what once would have been the retirement years and those of younger members, who rightly see the elderly as having saddled them with the cost of whatever benefits older generations enjoy.

Unions' political strength is also diminishing and is increasingly being surpassed by powerful blocs such as AARP, Hispanics, and African Americans.

The old paradigm of unions vs. corporations is obsolete. In today's economy, workers negotiate alongside management, winning shared bonuses.

42. Second and third careers are becoming common, as more people make mid-

life changes in occupation.

- The fast pace of technological change makes old careers obsolete, even as new ones open up to replace them.
- Americans born at the tail end of the Baby Boom (1956-1964) held an average of 10 jobs between ages 18 and 38, according to BLS. These job jumpers continue to take short-duration jobs even as they approach middle age: 70 percent of jobs they took between ages 33 and 39 ended within five years.
- Among these late Boomers, college-educated women tended to hold the most jobs over all (11.1) between ages 18 and 38, but their job switching occurred primarily in their youth. By their middle 30s, they held on average just 2.2 jobs between the ages of 33 and 38, compared with 2.5 jobs on average for all the late boomers, and 2.7 jobs for males with less than a bachelor's degree.
- Career changing may also be increasing, though BLS does not track the phenomenon since there is not a clear definition of what constitutes a "career change"—such as when a technician becomes a manager in the same company or industry. However, based on anecdotal data and personal observation, Forecasting International believes that people change careers on average every ten years.
- In the United States, 23 percent of workers surveyed in 2004 reported being dissatisfied with their careers and considering a change of occupation. Of these, 61 percent expressed a desire "to do something more fulfilling" such as entering a "helping profession."
- Seventy percent of Irish workers surveyed in 2004 said they hoped to make a career change in the near future. Women and individuals in the 26-35 age group were most likely to report the desire to change careers. "Personal fulfillment" was the biggest reason cited for making the change.

Implications: Boomers and their children will have not just two or three careers, but five or six, as dying industries are replaced by new opportunities.

"Earn while you learn" takes on new meaning: Most people will have to study for their next occupation, even as they pursue their current career.

In many two-earner couples, one member or the other will often take a sabbatical to prepare for a new career.

Self-employment is becoming an in-

creasingly attractive option, as being your own boss makes it easier to set aside time for career development. This is especially true for Gen Xers and Millennials.

Growing numbers of retirees will start their own businesses, both to keep occupied and to supplement their meager savings with new income. This trend has already begun.

Retirement plans must be revised so that workers can transfer medical and pension benefits from one career to the next—a change that has long been needed. We believe this will occur soon after the Baby Boom generation begins to retire in 2011.

43. The work ethic is vanishing.

- More than one-third of U.S. workers reported calling in sick when they were not ill at least once in the past 12 months, and 10 percent had done so at least three times, according to a 2004 survey by CareerBuilder.com.
- Job security and high pay are not the motivators they once were, because social mobility is high and people seek job fulfillment. Some 48 percent of those responding in a recent Louis Harris poll said they work because it "gives a feeling of real accomplishment."
- Fifty-five percent of the top executives interviewed in the poll say that erosion of the work ethic will have a major negative effect on corporate performance in the future.
- Ethics at the top are no better. Enron, WorldCom, Tyco International, Adelphia Cable, and ImClone just begin the list of companies implicated in deceptive accounting practices, looting of corporate assets, and other misdeeds. And the number of American political leaders either convicted of bribery and other corruption or under investigation grows almost daily.
- Seeking the root of such problems, a Zogby International poll of college seniors found that 97 percent said that their studies had prepared them to act ethically in the future. However, 73 percent said that professors had taught them that right and wrong are not susceptible to uniform standards, but depend on individual values and cultural norms.

Implications: The new generation of workers cannot simply be hired and ignored. They must be nurtured, paid well, and—especially—made to feel appreciated, or they will quickly look for a friend-

lier, more rewarding workplace.

Training is crucial. Without the opportunity to learn new skills, young people will quickly find a job that can help them prepare for the rest of their career.

44. Two-income couples are the norm, though the trend toward greater employment among women is slowing.

- The percentage of working-age women who are employed or are actively looking for work has grown steadily throughout the industrialized world. In the United States, it has grown from 46 percent in 1970 to about 66 percent in 2005, compared with 77 percent of men. The lowest fractions are found in Italy and Spain, were just 44 and 49 percent, respectively, of working-age women are in the labor force, according to the Organization for Economic Cooperation and Development.
- In the United States, both the husband and the wife worked in 50.9 percent of married-couple families in 2003, reports the BLS Current Population Survey. This fraction has declined since 1997, when it was 53.4 percent. However, families in which only the woman worked rose for the third straight year, to 6.8 percent, in 2003.
- In 2006, about 78 percent of American mothers worked or were actively looking for work, down from a peak of 80 percent four years earlier. Among mothers with children under age the fraction is stable at about 65 percent.
- This emphasis on work is one big reason the richest 25 percent to 50 percent of the U.S. population has reached zero population growth. They have no time for children and little interest in having large families.
- The number of working mothers with young children has declined in the last few years, but the dip is extremely small. In 2006, about 79 percent of American mothers and 64 percent of mothers with preschool age children held down jobs—down no more than a percent or two since the peak in 2002.

Implications: Demand for on-the-job child care, extended parental leave, and other family-oriented benefits can only grow. In the long run, this could erode the profitability of some American companies, unless it is matched by an equal growth in productivity.

Two-career couples can afford to eat out often, take frequent short vacations, and

buy new cars and other such goods. And they feel they deserve whatever time-savers and outright luxuries they can afford. This is quickly expanding the market for consumer goods and services, travel, and leisure activities.

This also promotes self-employment and entrepreneurialism, as one family member's salary can tide them over while the other works to establish a new business.

Look for families that usually have two incomes, but have frequent intervals in which one member takes a sabbatical or goes back to school to prepare for another career. As information technologies render former occupations obsolete, this will become the new norm.

45. Generation X and the Millennials will have major effects in the future.

- Members of Generation X—roughly, the 35-plus cohort—and especially of the Millennial generation, now in their 20s, have more in common with their peers throughout the world than with their parents' generation.
- There are approximately 50 million people in Europe between the ages of 15 and 24; 30 million more are between 25 and 29. The under-30 cohort represents about 22 percent of the European population.
- The under-20 cohort is remaining in school longer and taking longer to enter the workforce than before.
- Generation X should be renamed “generation E,” for entrepreneurial. Throughout the world, they are starting new businesses at an unprecedented rate.
- The younger Millennial generation is proving to be even more business-oriented, caring for little but the bottom line. Twice as many say they would prefer to own a business rather than be a top executive. Five times more would prefer to own a business rather than hold a key position in politics or government.
- Many in Generation X are economically conservative. On average, those who can do so begin saving much earlier in life than their parents did in order to protect themselves against unexpected adversity. They made money in the stock market boom of the 1990s, then lost it in the “dot-bomb” contraction, but have left their money in the market. For generations X and millennial, time is still on their side.

Implications: Employers will have

to adjust virtually all of their policies and practices to the values of these new and different generations, including finding new ways to motivate and reward them. Generation X and the Millennials thrive on challenge, opportunity, and training—whatever will best prepare them for their next career move. Cash is just the beginning of what they expect.

For these generations, lifelong learning is nothing new; it's just the way life is. Companies that can provide diverse, cutting-edge training will have a strong recruiting advantage over competitors that offer fewer opportunities to improve their skills and knowledge base.

Generations X and millennial are well equipped for work in an increasingly high-tech world, but have little interest in their employers' needs. They also have a powerful urge to do things their way.

As both customers and employees, they will demand even more advanced telecommunications and Net-based transactions.

46. Time is becoming the world's most precious commodity.

- Computers, electronic communications, the Internet, and other technologies are making national and international economies much more competitive.
- In the United States, workers spend about 10 percent more time on the job than they did a decade ago. European executives and nonunionized workers face the same trend.
- In this high-pressure environment, single workers and two-income couples are increasingly desperate for any product that offers to simplify their lives or grant them a taste of luxury—and they can afford to buy it.
- China's rapid economic development means its workers are experiencing faster-paced and time-pressured lives. In a recent survey by the Chinese news portal Sina.com, 56 percent of respondents said they felt short of time. That 64 percent said they were never late and were intolerant of other people's tardiness suggests a new cultural challenge to the traditional Chinese concept of a leisurely existence.
- Technical workers and executives in India are beginning to report the same job-related stresses, particularly when they work on U.S. and European schedules.

Implications: Stress-related problems affecting employee morale and wellness

will continue to grow. Companies must help employees balance their time at work with their family lives and need for leisure. This may reduce short-term profits but will aid profitability in the long run.

As time for shopping continues to evaporate, Internet and mail-order marketers will have a growing advantage over traditional stores.

China, India, and other developing countries can expect consumer trends similar to those in the U.S. as workers seek out convenience foods, household help, and minor luxuries to compensate for their lack of leisure time.

Management

47. More entrepreneurs start new businesses every year.

- In the United States, about 9 percent of men and 6 percent of women are self-employed. These fractions have been growing in about 20 of the 30 OECD countries.
- Looked at another way, women comprise a growing proportion of the self-employed in the U.S., up from about 27 percent in 1976 to 39 percent three decades later, according to the BLS.
- Workers under 30 would prefer to start their own company, rather than advance through the corporate ranks. Some 10 percent are actively trying to start their own businesses, three times as many as in previous generations.
- A large majority simply distrust large institutions. Most believe that jobs cannot provide a secure economic future in a time of rapid technological change. Examples of Silicon Valley start-ups that turned their founders into billionaires “overnight” dramatically advanced this change of values. This attitude seems to have been moderated only slightly by the failure of many dot-com companies.
- More women also are starting small businesses. Many are leaving traditional jobs to go home and open businesses, even as they begin a family. At least half of the estimated 10.6 million privately held firms in the United States are owned by women, employing 19.1 million people and generating \$2.46 trillion in sales annually.
- For the 14 years ending in 2003, the most recent year for which data is yet available, small businesses (those with less than 500 employees) created 92 percent of the

net new jobs in the United States, according to the Census Bureau. The smallest companies, those with fewer than 20 employees, created 85 percent of them.

- However, jobs also disappear fastest from small companies, which are much more likely to fail than larger concerns.

Implications: This is a self-perpetuating trend, as all those new service firms need other companies to handle chores outside their core business.

It is driven as well by the attitudes and values of Generation X and the Millennials and by the rapid developments in technology, which create endless opportunities for new business development.

Specialty boutiques will continue to spring up on the Internet for at least the next 15 years.

This trend will help to ease the poverty of many developing countries, as it already is doing in India and China.

48. Information-based organizations are quickly displacing the old command-and-control model of management.

- The typical large business has reshaped itself or is struggling to do so. Soon, it will be composed of specialists who rely on information from colleagues, customers, and headquarters to guide their actions.
- Management styles are changing as upper executives learn to consult these skilled workers on a wide variety of issues. Employees in turn are gaining new power with the authority to make decisions based on the data they develop.
- Information-based organizations require more specialists, who are found in operations, not at corporate headquarters. R&D, manufacturing, and marketing specialists increasingly work together as a team on all stages of product development rather than keeping each stage separate and distinct.
- Upper management is giving fewer detailed orders to subordinates. Instead, it sets performance expectations for the organization, its parts, and its specialists and supply the feedback necessary to determine whether results have met expectations.

Implications: This is a well-established trend. At this point, many large corporations have restructured their operations for greater flexibility. However, many others still have a long way to go.

This management style suits Gen Xers and Millennials well, as it tends to let them

work in whatever fashion suits them so long as the job gets done.

Downsizing has spread from manufacturing industries to the service economy. Again, this process encourages the entrepreneurial trend, both to provide services for companies outsourcing their secondary functions and to provide jobs for displaced employees.

Many older workers have been eliminated in this process, depriving companies of their corporate memory. Companies have replaced them with younger workers, whose experience of hard times is limited to the relatively mild recession since 2000. Many firms may discover that they need to recruit older workers to help them adapt to adversity.

This too is driving the entrepreneurial trend. Many older workers find themselves self-employed by default, as they need income and cannot find work in their accustomed fields.

49. A typical large business in 2015 will have fewer than half the management levels of its counterpart in 1995, and about one-third as many managers.

- Computers and information-management systems have stretched the manager’s effective span of control from six to 21 subordinates. Information now flows from front-line workers to higher management for analysis. Thus, fewer mid-level managers are needed, flattening the corporate pyramid.
- Downsizing, restructuring, reorganization, and cutbacks of white-collar workers will continue through 2008. Outsourcing will continue to grow until at least 2010.
- However, many companies are finding it necessary to bring back older workers, so as to preserve an effective corporate memory.
- Opportunities for advancement are shrinking, because they come within the worker’s narrow specialty, rather than at the broader corporate level. By 2001, only one person in 50 was promoted, compared with one in 20 in 1987.

Implications: Information-based organizations must make a special effort to prepare professional specialists to become business leaders. Broad experience of the kind needed by a CEO no longer comes naturally curing an executive’s career.

Top managers must be computer-literate

to retain their jobs and must make sure they achieve the increased span of control that computers make possible.

Finding top managers with the broad experience needed to run a major business already has become difficult. It can only grow more so as the demand for specialization grows. This will reduce promotion from within and encourage companies to seek upper-level execs from other firms, and even industries.

Executives increasingly will start their own companies, rather than trusting the old-fashioned corporate career path to provide advancement.

50. Government regulations will continue to take up a growing portion of the manager's time and effort.

- In 1996, the U.S. Congress passed regulatory reform laws intended to slow the proliferation of government regulations. Nonetheless, by 2001 more than 14,000 new regulations were enacted. Not one proposed regulation was rejected during this period.

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- In 2004, the *Federal Register*, which records regulations proposed and enacted, ran to more than 75,600 pages. To keep up with the flow, it is published daily. It has not missed a day since its first edition in 1936.

- The Brussels bureaucrats of the European Union are churning out regulations at an even faster rate, overlaying a standard regulatory structure on all the national systems of the member countries.

- The growth of regulations is not necessarily all bad. A study by the Congressional Office of Management and Budget estimated that the annual cost of major federal regulations enacted in the decade ending September 2002 amounted to between \$38 billion and \$44 billion per year. However, the estimated benefits of those regulations added up to between \$135 billion and \$218 billion annually.

Implications: Regulations are necessary, unavoidable, and often beneficial. Yet it is difficult not to see them as a kind of friction that slows both current business

and future economic growth.

The proliferation of regulations in the developed world could give a competitive advantage to countries such as India and China, where regulations that impede investment and capital flow are being stripped away, while health, occupational safety, and environmental codes are still rudimentary or absent.

However, there is a significant penalty for the kind of risk that comes from inadequate regulation. China pays an estimated risk penalty of 6.49 percent for international borrowing. Per capita GDP, access to capital, foreign direct investment, and other measures of a country's economic health all decline directly with a rising Opacity Index, which is heavily influenced by the lack of effective regulations to guarantee a level playing field for those doing business there.

Nonetheless, lands such as Russia will remain at a competitive disadvantage until they can pass and enforce the regulations needed to ensure a stable, fair business environment.

Institutions

51. Multinational corporations are uniting the world, and growing more exposed to its risks.

- Multinational corporations that rely on indigenous workers may be hindered by the increasing number of AIDS cases in Africa and around the world. Up to 90 percent of the population in parts of sub-Saharan Africa reportedly tests positive for the HIV virus in some surveys. Thailand is almost equally stricken, and many other parts of Asia show signs that the AIDS epidemic is spreading among their populations.

- The continuing fragmentation of the post-Cold War world has reduced the stability of some lands where government formerly could guarantee a favorable—or at least predictable—business environment. The current unrest in Iraq is one example.

- One risk now declining is the threat of currency fluctuations. In Europe, at least, the adoption of the euro is making for a more stable economic environment.

Implications: It is becoming ever more difficult for business to be confident that decisions about plant location, marketing, and other critical issues will continue to appear wise even five years into the future.

All long-term plans must include an even greater margin for risk management. This will encourage outsourcing, rather than investment in offshore facilities that could be endangered by sudden changes in business conditions.

Countries that can demonstrate a significant likelihood of stability and predictable business outcomes will enjoy a strong competitive advantage over neighbors that cannot. Witness the rapid growth of investment in India now that deregulation and privatization have general political support, compared with other Asian lands where conditions are less predictable.

Although Russia has continued to attract Western investment, particularly in its energy industry, the increasingly autocratic governance by the Putin regime and any successors could eventually discourage foreign companies from doing business there or require much more favorable terms to justify accepting the associated risks.

Major corporations also can help to moderate some risks in unstable countries, such as by threatening to take their business elsewhere.

52. International exposure includes a greater risk of terrorist attack.

- State-sponsored terrorism has nearly vanished, as tougher sanctions made it more trouble than it was worth. However, some rogue states may still provide logistical or technological support for independent terrorist organizations when opportunities present themselves.

- Until recently, attacks on U.S. companies were limited to rock-throwing at the local McDonalds, occasional bombings of bank branches and of U.S.-owned pipelines in South America, and kidnappings. Since September 11, U.S.-owned hotel chains have experienced several major bombings, in part because U.S. government facilities overseas have been effectively hardened against terrorist assault.

- Nothing will prevent small, local political organizations and special-interest groups from using terror to promote their causes. These organizations have found inspiration, and many have found common cause, in the successes of Al Qaeda.

- As the United States has been forced to recognize, the most dangerous terrorist groups are no longer motivated by specific political goals, but by generalized, virulent hatred based on religion and culture.

- On balance, the amount of terrorist activity in the world will continue to rise, not decline, in the next 10 years. This was seen in corrections to the State Department's April 2004 report on terrorism, which originally seemed to show a sharp drop in terrorist incidents and was used to claim success for the Bush administration's tactics in the "war on terror." In fact, terrorist attacks had risen sharply since the invasion of Iraq, both in number and in severity.

- Terrorism has continued to grow around the world as the Iraq war proceeds.

- Risks of terrorism are greatest in countries with repressive governments and large numbers of unemployed, educated young men.

Implications: Terrorism against the West is likely to grow, not decline, when fighters trained and blooded in the Iraq war are able to turn their attention elsewhere.

Western corporations may have to devote more of their resources to self-defense, while accepting smaller-than-expected profits from operations in the developing countries.

Like the attacks on the World Trade Center and Pentagon, the American embassies in Kenya and Tanzania before them, and the bombings of the Madrid rail system and London subways since then, any attacks on major corporate facilities will be designed for maximum destruction and casualties. Bloodshed for its own sake has become a characteristic of modern terrorism.

Where terrorism is most common, countries will find it difficult to attract foreign investment, no matter how attractive their resources.

Though Islamic terrorists form only a tiny part of the Muslim community, they have a large potential for disruption throughout the region from Turkey to the Philippines.

The economies of the industrialized nations could be thrown into recession at any time by another terrorist event on the scale of September 11. This is particularly true of the United States. The impact would be greatest if the attack discouraged travel, as the September 11 attacks did.

The U.S. economy is being affected already by American anti-terrorism measures. Since Washington began to photograph incoming travelers and required more extensive identification from them, tourism to the United States is off by some 30 percent. The number of foreign students coming to

American universities has declined by a similar amount.

53. Consumers increasingly demand social responsibility from companies and each other.

- Companies increasingly are being judged on how they treat the environment. Many are changing their business practices as a result. For example, home-improvement retailers Home Depot and Lowe's have stopped buying wood from countries with endangered forests.

- Safety testing of children's products also enforces corporate responsibility. One company recently was forced to recall a line of toys because the makers had used lead paint. The venerable Easy-Bake Ovens were recalled because children's hands or fingers could get caught in the door, exposing them to severe burns.

- With 5 percent of the world's population and 66 percent of the lawyers on the planet, American citizens do not hesitate to litigate if their demands are not met. Other countries, such as India and China, are beginning to see more legal actions on behalf of citizen's causes.

Implications: Once the current, business-friendly administration leaves Washington, government intervention will supplant deregulation in the airline industry (in the interest of safety and services), financial services (to control instability and costs), electric utilities (nuclear problems), and the chemical industry (toxic wastes).

For industry, this represents one more powerful pressure to adopt environmentally friendly technologies, to work with area schools and community groups, and to participate in other local activities in ways that will give them a friendly, responsible image. It also represents an opportunity to market to environmentally concerned consumers.

As the Internet spreads Western attitudes throughout the world, consumers and environmental activists in other regions will find more ways to use local court systems to promote their goals. Litigation is likely to become a global risk for companies that do not make the environment a priority.

54. On average, institutions are growing more transparent in their operations, and more accountable for their misdeeds.

- China, rated by Kurtzman Group as the most opaque of the major nations, was

forced to open many of its records as a precondition for joining the World Trade Organization.

- In India, a country often regarded as one of the world's most corrupt, the Central Vigilance Commission has opened the country's banking system to more effective oversight. Lesser "vigilance commissions" now oversee many parts of the Indian economy and government.

- In the United States, powerful forces are inspiring demands for greater transparency and accountability in large institutions. These include both the wave of business scandals in 2004, the controversy over child abuse within the Catholic Church, and the extreme unwillingness of the Bush administration to accept oversight by Congress.

- The wave of support for government since the September 11 terrorist attacks has made Americans willing to accept greater transparency—that is, less privacy—in their personal lives.

- Wars against terrorism, drug trafficking, and money laundering are opening the world's money conduits to greater scrutiny. It is also opening up the operations of non-governmental organizations that function primarily as charitable and social-service agencies but are linked to terrorism as well.

Implications: Countries with high levels of transparency tend to be much more stable than more opaque lands.

They also tend to be much more prosperous, in part because they find it easier to attract foreign investment.

Greater transparency reduces the operational effectiveness of the world's drug traffickers and terrorist organizations.

It also tends to reduce misdeeds by government and bureaucrats.

55. Institutions are undergoing a bimodal distribution: The big get bigger, the small survive, and the mid-sized are squeezed out.

- By 2012, there will be only five giant automobile firms. Production and assembly will be centered in Korea, Italy, and Latin America.

- The six largest airlines in the United States today control 65 percent of the domestic market, leaving roughly one-third to be divided among many smaller carriers. Many of these are no-frills carriers with limited service on a few routes where de-

mand is high or competition is unusually low.

* Where local regulations allow, mergers and acquisitions are an international game. Witness the takeovers of the United States MCI by WorldCom in the United Kingdom and of Chrysler by Daimler-Benz. The continuing removal of trade barriers among EU nations will keep this trend active for at least the next decade.

• We are now well into the second decade of the micro-segmentation trend, as more and more highly specialized businesses and entrepreneurs search for narrower niches. These small firms will prosper, even as

mid-sized, "plain vanilla" competitors die out. This trend extends to nearly every endeavor, from retail to agriculture.

• "Boutique" businesses that provide entertainment, financial planning, and preventive medical care for aging baby boomers will be among the fastest-growing segments of the U.S. economy.

Implications: Thus far, industries dominated by small, regional, often family-owned companies have been relatively exempt from the consolidation now transforming many other businesses. Takeovers are likely even in these industries in the next decade.

This consolidation will extend increas-

ingly to Internet-based businesses, where well-financed companies are trying to absorb or out-compete tiny online start-ups, much as they have done in the brick-and-mortar world.

However, niche markets will continue to encourage the creation of new businesses. In Europe as of 2006, no fewer than 48 small, no-frills airlines in 22 countries had sprung up to capture about 28 percent of the Continental market share. Only 15 offered more than 50 flights per day.

No company is too large to be a takeover target if it dominates a profitable market or has other features attractive to profit-hungry investors.

