

Minnesota Future Work Strategic Planning Trends 2005

This trend report was prepared by the Minnesota Future Work (MFW) project staff for the Office of the Chancellor, Minnesota State Colleges and Universities, as part of their strategic planning process. The report has two parts. The first part contains a summary of MFW findings for Minnesota and global trends from the World Futures Society's "53 Trends Now Shaping the Future" report. Following the summary is a listing of the scans that support the MFW trends.

Summary of trends

Demographics Trends

The size of the current 10 to 29 year-old population cohort is larger than the post war baby-boom cohort. According to the latest U.S. estimates for 2003, there were 81.5 million Americans aged 10 to 29 years and 79.5 million aged 40 to 59 years.

Of the 10 fastest-growing states from 2003 to 2004, five are in the West and five in the South.

Aging baby boomers in Minnesota will require health care and additional services, while the numbers of workers will grow steadily, but not fast enough to maintain today's dependency ratio.

Minnesota's population will continue to become more racially and ethnically diverse.

Women made up a majority of students awarded associate's and bachelor's degrees, but earn less than men, even when controlling for undergraduate field of study.

World Future Society Trends

2. The world's population will grow to 9 billion by 2050.
3. The population of the developed world is living longer.
4. The elderly population is growing dramatically throughout the world.
6. Mass migration is redistributing the world's population.
15. The women's equality movement is beginning to lose its significance, thanks largely to past successes.
42. Generations X and Dot-com will have major effects in the future.

Economic Trends

Central and Northwest Minnesota, along with the Twin Cities region, are projected have the fastest employment growth through 2012.

Professional and related occupations and service occupations, which tend to have occupations at opposite ends of the educational attainment and earnings spectrum, will increase the fastest and add the most jobs in Minnesota from 2002 to 2012.

More and more workers will become "workplace chameleons" switching from one skill to another depending upon the project requirements and timings.

China and the U.S. have taken on the role of global manufacturer.

World Future Society Trends

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.
8. The global economy is growing more integrated.
34. Specialization is spreading throughout industry and the professions.
35. Services are the fastest-growing sector of the global economy.

- 37. Workers are retiring later as life expectancy stretches.
- 40. The work ethic is vanishing.
- 43. Time is becoming the world's most precious commodity.
- 44. More entrepreneurs start new businesses every year.
- 46. A typical large business in 2010 will have fewer than half the management levels of its counterpart in 1990, and about one-third the number of managers.
- 47. Government regulations will continue to take up a growing portion of the manager's time and effort.
- 48. Multinational corporations are uniting the world, and growing more exposed to its risks.
- 49. International exposure includes a greater risk of terrorist attack.

Society Trends

Many black and other minority children drop out of high school in numbers far out of proportion to their enrollment.

According to an increasing body of evidence, how much prestige the outside world assigns to a job plays a sizable role in job satisfaction.

World Future Society Trends

- 11. Young people place increasing importance on economic success, which they have come to expect.
- 13. The physical-culture and personal-health movements will remain strong, but far from universal.
- 16. Family structures are becoming more diverse.
- 50. Consumers increasingly demand social responsibility from companies and each other.
- 51. On average, institutions are growing more transparent in their operations, and more accountable for their misdeeds.

Technology Trends

Handheld devices -- as effective as a fully functioning personal computer, digital video camera, telephone, MP3 player and video player -- permit continuous connectivity.

Autonomous nanotechnology swarms are on their way to becoming reality.

While outsourcing will continue, employment in the U.S. will continue to offer ample opportunities for software developers and other IT professionals

U.S. programmers are falling behind.

World Future Society Trends

- 29. Advances in transportation technology will make travel and shipping faster, cheaper, and safer, by land, sea, and air.
- 30. The pace of technological change accelerates with each new generation of discoveries and applications.

Competition Trends

The corporate for-profit model post secondary school is the fastest-growing areas of the \$315.5 billion postsecondary market in North America.

World Future Society Trends

- 33. Education and training are expanding throughout society.

Minnesota Future Work Trends for Strategic Planning

Demographic Trends

The size of the current 10 to 29 cohorts population is larger than the post war baby-boom cohorts. The latest U.S. estimates for 2003 show 81.5 million Americans aged 10 to 29 years and 79.5 million aged 40 to 59 years.

New Population Bulge

	2003	2002	2001	2000
10 to 14 years	21,193,360	21,093,745	20,881,535	20,593,921
15 to 19 years	20,477,476	20,347,615	20,262,284	20,215,882
20 to 24 years	20,727,686	20,329,952	19,776,750	19,150,745
25 to 29 years	19,167,954	18,901,901	18,968,894	19,253,434
	81,566,476	80,673,213	79,889,463	79,213,982

Baby Boomers

	2003	2002	2001	2000
40 to 44 years	22,962,590	22,941,936	22,790,706	22,529,304
45 to 49 years	21,761,185	21,264,092	20,779,107	20,225,999
50 to 54 years	19,043,411	18,764,691	18,421,374	17,820,575
55 to 59 years	15,794,050	14,972,664	14,187,574	13,566,638
	79,561,236	77,943,383	76,178,761	74,142,516

Source: Population
Division,
U.S. Census Bureau
Release Date:
6/14/2004

Of the 10 fastest-growing states from 2003 to 2004, five are in the West and five in the South.

The nation's population grew by 1.0 percent (2.9 million people) between July 1, 2003, and July 1, 2004, to 293.7 million, according to estimates released today by the U.S. Census Bureau. With a growth rate of 4.1 percent, Nevada ranked first among states for the 18th consecutive year.

Four nearby states joined Nevada on the list of the nation's 10 fastest-growing: Arizona (second), Idaho (fourth), Utah (seventh) and New Mexico (10th). The remaining top 10 fastest-growing states are all coastal: Florida (third), Georgia (fifth), Texas (sixth), Delaware (eighth) and North Carolina (ninth).

North Carolina and New Mexico replaced California and Hawaii on the list of the top 10 fastest-growing states this year.

Of the 10 fastest-growing states from 2003 to 2004, five are in the West and five in the South. The South now accounts for 36 percent of the nation's total population, with the West comprising 23 percent, the Midwest 22 percent and the Northeast 19 percent.

California remained the most populous state in the nation with 35.9 million people in 2004. The second and third most populous states were Texas (22.5 million) and New York (19.2 million).

Minnesota ranked 26th in rate of growth and 18th in numerical growth, among the fastest growing Midwestern and Northeast states.

Other highlights:

- The nation's 10 most populous states accounted for 54 percent of the nation's population on July 1, 2004.
- The 10 fastest-growing states accounted for 49 percent of the national growth from 2003 to 2004.
- Of the 10 most populous states in 2004, three (New York, Pennsylvania, New Jersey) are in the Northeast, three (Illinois, Ohio, Michigan) in the Midwest, three (Texas, Florida, Georgia) in the South and one (California) in the West.
- While the South had the largest numerical increase in population among regions from 2003 to 2004 (1.5 million), the West recorded the fastest rate of growth (1.5 percent).

Source: Nation Adds 3 Million People in Last Year; Nevada Again Fastest-Growing State, Census Bureau, December 22, 2004

Aging baby boomers in Minnesota will require health care and additional services, while the number workers grows steadily but not fast enough to maintain today's dependency ratio.

Does the year 2011 mean anything to you? Maybe not now, but it will. That's the year the front ranks of the baby boomers will reach age 65. Succeeding waves of boomers will follow, year after year. The "dependency ratio," which is a rough measure of how many people are not in the work force compared to how many are.

You get Minnesota's dependency ratio by counting up all children 14 or younger plus adults 65 or older. Then you divide that total by the number of working-age people 15 to 64 years old and multiply by 100. In 1960, the state's dependency ratio was 76.1 — meaning there were 76.1 dependents for every 100 people of working age. The baby boomers were flocking to the grade schools. Since the 1960's, with the boomers working, the ratio has been falling. In 2011, they will start leaving the work force en masse. Then the dependency ratio, expected to hit bottom at 47.3 in 2010, will march up again — sharply and steadily, thanks to the same boomers who drove it up in the 1950s. But there will be a huge difference: This time, they'll be retirees, not grade-schoolers.

Then, says Gillaspay, a new portrait of Minnesota will emerge. Here's just a glimpse of changes they see ahead:

- Worker shortages. The help-wanted signs, now coming back after a down time for the business cycle, could stay up for years once the boomer retirements kick in.
- Difficulty maintaining a strong tax base. Retirees have less income, so they'll pay fewer taxes. As they age, their resistance to taxes is likely to increase.
- Colleges and universities, hurting for students coming directly from high school, will compete more intensely for "nontraditional students" of all ages.

Source: "Minnesota's good life faces test as boomers age", Pioneer Press, Dave Beal, 1/23/2005

Minnesota's population will continue to become more racially and ethnically diverse.

Minnesota's population will continue to become more racially and ethnically diverse, according to a new report from the State Demographic Center at the Minnesota Department of Administration. Between 2005 and 2015, the nonwhite population is projected to grow 35 percent, compared to 7 percent for the white population. The Hispanic Origin population is expected to increase 47 percent.

"Minnesota is changing, though we are still less diverse than the nation," said State Demographer Tom Gillaspy. He added that much of the rapid growth in the nonwhite and Latino population stems from migration from other states and from outside the U.S.

Nonwhites and Latinos are younger than white Minnesotans, which will continue to be true in the future. In 2015, the projections show that 19 percent of children under age 15 will be nonwhite, compared to only 5 percent of people over age 65.

The report says that by 2030, about 16 percent of Minnesotans will be nonwhite and 5 percent will be Latino. By comparison, the Census Bureau estimates that in 2003, 20 percent of Americans were nonwhite and 14 percent were of Hispanic Origin.

Source: [Minnesota population projections by race and Hispanic origin](#), State Demographic Center, January 12, 2005

In spite of graduating with the majority of higher education degrees, women continue to earn less than men.

Between 1970 and 2001, women went from being the minority to the majority of the U.S. undergraduate population, increasing their representation from 41 percent to 56 percent. Consistent with these enrollment changes, women surpassed their male peers in education expectations and degree attainment over the last 30 years.

The majority of 1992-93 and 1999-2000 bachelor's degree recipients were employed 1 year after graduation. However, for both cohorts of college graduates, men were more likely than women to be working full-time, while women were more likely than men to be working part-time.

Even when controlling for undergraduate field of study, men earned higher average annual salaries than women in at least one-half of the fields examined. For example, in both cohorts, men who majored in engineering, mathematics, and science fields earned higher average full-time annual salaries than women who majored in these fields (\$33,300 vs. \$27,900 in 1994 and \$45,200 vs. \$34,200 in 2001). In other words, in 1994 women with degrees in these fields earned, on average, \$5,400 less than men, or about 84 percent of what men earned, and 7 years later in 2001, women earned \$11,000 less or 76 percent of what men earned. Additionally, in 2001, men who majored in fields related to humanities and social/behavioral science or health, vocational/technical, and other technical/professional fields earned higher annual average salaries than their female counterparts, while such a difference was not detected in 1994.

Source: Gender Differences in Participation and Completion of Undergraduate Education and How They Have Changed Over Time, National Center for Education Statistics, 2/2005

Economic Trends

Central and Northwest Minnesota, along with the Twin Cities region, are projected have the fastest employment growth through 2012

Sustained job growth returned to Minnesota in 2004 with the Central and Northwest regions leading the comeback from three years of sub-par job growth. These two regions, along with the Twin Cities region, are projected to continue to set the pace over the long run adding employment at a faster clip than the rest of the state through 2012. Southeast Minnesota is projected to be right

behind the three fastest growing regions while the Northeast and Southwest regions are expected to continue to lag slightly behind.

Central Minnesota, with five counties adjacent to the Twin Cities region, has been setting the pace for employment expansion for more than 30 years and will continue to be the fastest growing region. Most of the growth is generated by the home-building spillover from the Twin Cities along the I-94 corridor and up I-35 north of the Twin Cities. Employment in Central Minnesota is expected to expand 20.8 percent between 2002 and 2012. This rate is below the 27.1 percent growth achieved during the 1992-2002 period, but the projected creation of 59,000 jobs will almost match the 60,500 jobs added between 1992 and 2002.

The seven-county Twin Cities region is projected to generate 256,600 new jobs between 2002 and 2012, which is 60.4 percent of statewide employment growth projected for the 10 years. The Twin Cities region's share of the state's employment pie peaked at 60.4 in 2000 but was down to 59.6 by 2002, as the recession hit harder in the metro area than in any other region of the state. The brunt of the economic slowdown fell on the region's manufacturing, transportation, information, and computer system design industries. All these industries, except for manufacturing, are expected to rebound over the next few years helping to expand employment in the region by 14.9 percent between 2002 and 2012. Service-providing industries, like employment services, computer systems design services, colleges, full-service restaurants, and offices of physicians will drive employment growth in the Twin Cities region.

Employment in Northwest Minnesota is projected to grow 14.4 percent over the 10-year period. Regional manufacturing employment is expected to be the strongest in Northwest Minnesota. Second-home and retirement-home development in the lake areas of Northwest Minnesota will add to the region's economic growth.

Southeast Minnesota employment, driven by the health care industry and the region's close proximity to the Twin Cities region, is anticipated to expand 13.7 percent by 2012.

Employment growth in Northeast Minnesota will be slowed by taconite mining job losses even though manufacturing jobs are expected to increase slightly. The main job generator in Northeast Minnesota over the next 10 years will be the health sector. Job growth between 2002 and 2012 is projected to be 11.3 percent in this region.

Expanding health care and manufacturing jobs will help push Southwest Minnesota's employment base up 9.2 percent from 2002 to 2012. The 9.2 percent is down from the 11.0 percent growth achieved between 1992 and 2002 when 21,300 jobs were added in the region. Between 2002 and 2012 the region is projected to add about 19,700 jobs.

Source: "Projected Regional Employment Growth, 2002 – 2012", Minnesota Employment Review, DEED-LMI, May 2005

Professional and related occupations and service occupations, which tend to have occupations at opposite ends of the educational attainment and earnings spectrum, will increase the fastest and add the most jobs in Minnesota from 2002 to 2012.

The two largest major occupational groups in Minnesota—professional and related occupations; and service occupations—will increase the fastest and add the most jobs in Minnesota from 2002 to 2012. These two major occupational groups, which tend to have occupations at opposite ends of the educational attainment and earnings spectrum, are projected to account for more than half of all employment growth over the next 10 years.

All major occupational groups are projected to add jobs between 2002 and 2012 except for the farming, fishing, and forestry group, which is expected to decline slightly. Sales and related occupations and construction occupations are also projected to grow faster than overall

employment. Employment is projected to increase about as fast as overall employment in management, business, and financial occupations. Transportation and material moving jobs and installation, maintenance, and repair jobs are expected to grow at a rate slightly below overall job growth. Office and administrative support occupations and production occupations are projected to grow at half the rate of overall job growth.

The fastest growing occupations tend to be health care, education, or information technology occupations. Occupations adding the most jobs tend to be spread across more sectors than the fastest growing occupations and had larger employment bases in 2002.

Job opportunities tend to be better in occupations that are growing, but such openings are only part of the future job-openings picture. Opportunities in any occupation also depend on how many workers are leaving an occupation permanently and how many jobseekers are competing for the openings.

For most occupations the number of job openings arising from the need to replace workers is projected to be higher than job openings from employment growth.

Even occupations that are expected to decline in numbers over the next 10 years will have replacement openings.

In addition to the 425,000 job openings projected to be created by job growth over the next 10 years, 677,000 net replacement openings are projected. Occupations with high numbers of net replacement openings tend to be occupations with a large employment base in 2002 and high turnover. About 70.0 percent of the occupations are projected to have more net replacement openings than openings from employment growth. Net replacement openings need to be considered when comparing the prospects among occupations.

Source: "Minnesota Job Outlook to 2012", Minnesota Employment Review, DEED-LMI, December 2004

More and more workers will become "workplace chameleons" switching from one skill to another depending upon the project requirements and timings.

Information Design has arguably been around since man could first scribble on cave walls, but the term has only gathered recognition within the last 25 years. For those of you unfamiliar with the term, the Society of Technical Communication (STC) Special Interest Group on Information Design provides the following definition: "The field of information design applies traditional and evolving design principles to the process of translating complex, unorganized, or unstructured data into valuable, meaningful information. The practice of information design requires an interdisciplinary approach which combines skills in graphic design, writing and editing, instructional design, human performance technology, and human factors."

An Information Designer should have at least some degree of skill in information organization, graphic design, writing, screen layout, web client-server scripting, human-computer interaction design, instructional design and usability testing? The next generation of Information Designers will learn, practice and perfect several of the skills currently performed by multiple people. Over the long term, we believe there will be a skill convergence as people slowly add new skills to their personal inventory. In effect, they will become "workplace chameleons" switching from one skill to another depending upon the project requirements and timings. Over time, we believe that this combination of skills will become the norm and may even become mandatory for many positions. Given the current economic climate, employers are already demanding more from their prospective new hires. As evidence of this trend, look at the career section in your local newspaper and you will see that employers are now asking for combination skill sets for many jobs. Companies are looking for people who can simultaneously write, design and develop

websites. With a small amount of cross training, many of today's Information Designers could position themselves for the related Information Designer multi-skilled jobs.

Source: "So Where are all the Information Designers?" Online Learning, Doug Talbott, 3/2005

U.S. and China have taken on the role of global manufacturer.

On the list of the 30 countries and regional economies evaluated by the IMD, the United States came in first for overall competitiveness, followed by Canada and Australia. The Shejiang Province of China took sixth place.

Korea ranks behind Asian countries such as China, India, Taiwan, Malaysia and Japan in national competitiveness, according to a Swiss consulting firm. The Institute for Management Development (IMD) reported that Korea stands at the 15th spot in the competitiveness ranking of 30 major economies with a population of more than 20 million in 2004. Korea placed 15th the previous year as well.

The rankings are 10th for China, 14th for India, 4th for Taiwan, 5th for Malaysia and 9th for Japan. India noticeably jumped seven notches from last year.

Source: "Korea Behind Malaysia, India in Competitiveness", UNPAN, Bae Keun-min, 5/2004

"The China price." They are the three scariest words in U.S. industry. In general, it means 30% to 50% less than what you can possibly make something for in the U.S. In the worst cases, it means below your cost of materials. Makers of apparel, footwear, electric appliances, and plastics products, which have been shutting U.S. factories for decades, know well the futility of trying to match the China price. It has been a big factor in the loss of 2.7 million manufacturing jobs since 2000. Meanwhile, America's deficit with China keeps soaring to new records. It is likely to pass \$150 billion this year.

Now, manufacturers and workers who never thought they had to worry about the China price are confronting the new math of the mainland. These companies had once held their own against imports mostly because their businesses required advanced skills, heavy investment, and proximity to customers. Many of these companies are in the small-to-midsize sector, which makes up 37% of U.S. manufacturing. The China price is even being felt in high tech. Chinese exports of advanced networking gear, still at a low level, are already affecting prices. And there's talk by some that China could eventually become a major car exporter.

America has survived import waves before, from Japan, South Korea, and Mexico. And it has lived with China for two decades. But something very different is happening. The assumption has long been that the U.S. and other industrialized nations will keep leading in knowledge-intensive industries while developing nations focus on lower-skill sectors. That's now open to debate. "What is stunning about China is that for the first time we have a huge, poor country that can compete both with very low wages and in high tech," says Harvard University economist Richard B. Freeman. "Combine the two, and America has a problem."

Source: "The China Price", By Pete Engardio, Business Week, December 6, 2004

Social Trends

Many black and other minority children drop out of high school in numbers far out of proportion to their enrollment. But, immigrants fare well.

Growing numbers of Minnesota students are stepping directly from high school into higher education, though officials say more needs to be done to get students, especially students of color,

through high school. Sixty-five percent of Minnesota's 64,000 high school graduates in 2003 kept their education going, enrolling in community colleges, public and private universities and trade and vocational schools, a report released Wednesday by the Minnesota Higher Education Services Office shows. About 32,000 students continued their education in Minnesota while close to 10,000 went elsewhere.

The data showed some promising trends, with a nearly 10 percent increase over a decade in the number of Minnesota high school graduates who kept their education rolling. The 2003 data also showed 50 percent of high school students of color who graduated kept their education going in Minnesota — about the same rate as whites. The problem, officials say, is that many minority children drop out of high school in numbers far out of proportion to their enrollment. Students of color made up 17 percent of the junior and senior high student body in Minnesota public schools in 2003 while 44 percent of that population dropped out of school, state data show.

Source: "Dropout rate for students of color has some concerned", Pioneer Press, Paul Tosto, 2/24/2005

The National Foundation for American Policy, based in Arlington, Va., found that foreign-born professionals and students are outstanding assets to American society, and that their children are the nation's rising intellectual superstars. According to the study, children of immigrants were: 60 percent (24 of 40) of the finalists in the 2004 Intel Science Talent Search; 65 percent (13 of 20) of the U.S. Math Olympiad's top scorers, and 46 percent (11 of 24) of the U.S. Physics Team members. Some of those academic standouts followed in the footsteps of parents who came to this country and excelled. More than 50 percent of the engineers and 45 percent of the math and computer scientists with Ph.D.s in the United States were born outside the country.

Source: "Brain gain, immigrant children excel", Star Tribune, 7/30/2004

According to an increasing body of evidence, how much prestige the outside world assigns to a job plays a sizable role in job satisfaction. That could portend consequences, not only for the well-being of workers and the success of companies, but also for the health of the economy.

Teachers have made a prestige leap in the eyes of the public. In 1977, 29% of us assigned great prestige to that job. By 2004, it was 48%, according to a separate Harris survey sponsored by the MetLife Foundation. During roughly the same period, the percentage of teachers who say they are very satisfied with teaching as a career rose from 40% to 57%.

Two million manufacturing jobs were lost in the last recession, yet the National Association of Manufacturers forecasts a shortage of 10 million skilled manufacturing workers by 2020, largely because students in middle school through college describe such jobs as "repetitious," "tedious," "boring," "dark" and "dirty." That career would be like serving a life sentence or being on a chain gang, they say, according to a report called "Keeping America Competitive: How a talent shortage threatens U.S. manufacturing" Last year, the Association for Manufacturing Technology brought 6,095 students and 578 educators to see a modern plant. The students left impressed, says AMT President John Byrd, but he adds that parents must be shown the prestige of a high-tech manufacturing job, or they steer their children away. During his tenure as CEO of Symmetry Medical from 1996 to 2002, Byrd thought he was making an impression when he took high school guidance counselors on a tour of a state-of-the-art factory. But he still remembers one remarking that he would not want his son working there because he'd rather see him in a shirt and tie.

There is little correlation between prestige and money. Harris found that firefighters, teachers, nurses and police officers all score well on prestige, while the prestige of professional athletes has fallen as their incomes have risen. A survey released in February by the Conference Board said that job satisfaction has declined during the past nine years. Yet 17% of those making less than \$15,000 a year say they are very satisfied with their jobs, vs. 14% of those who make more than \$50,000 a year.

Source: "Are you proud of your job?" By Del Jones, USA TODAY, 5/23/2005
<http://www.usatoday.com/>

Technology Trends

Handheld devices, as effective as a fully functioning personal computer, digital video camera, telephone, MP3 player and video player, permit continuous connectivity.

While the complete functionality of the teleputer, there is little doubt about the direction we are headed in. This is very important from the point of view of users in the emerging markets. For many, it is the mobile phone, rather than the computer, which will provide the first glimpse of the Internet and the Web.

This is what Jonathan Schwartz of "Sun" said after his visit to 3GSM: "The majority of the world will first experience the internet through its mobile phones. We sometimes forget that 10 times as many people bought handsets last year as PCs. Round numbers, there were a billion wireless devices sold last year, and around 100 million PCs. To that end, the odds are much higher you'll watch broadcast broadband content on your phone than on your PC -- and now that Nokia (and their peers) are the world's largest camera manufacturers (just think about that for a moment), the odds are far higher you'll even create broadband content on your handset.

Mobile phones are also being hailed as the key to development. The Economist wrote recently (March 10 issue): "Plenty of evidence suggests that the mobile phone is the technology with the greatest impact on development. A new paper finds that mobile phones raise long-term growth rates, that their impact is twice as big in developing nations as in developed ones, and that an extra 10 phones per 100 people in a typical developing country increases GDP growth by 0.6 percentage point. Mobile phones do not rely on a permanent electricity supply and can be used by people who cannot read or write."

Source: "The coming age of teleputers", <http://inhome.rediff.com/>, 4/15/2005

Autonomous nanotechnology swarms are on their way to becoming reality.

Engineers at the National Aeronautics and Space Administration are testing a robot that they hope to shrink to nanobot size and eventually form what NASA calls "autonomous nanotechnology swarms," ANTS. The researchers aim to give ANTS enough artificial intelligence to make smart decisions as well as know intuitively when and how to walk and swarm.

NASA invites you to consider the versatility of a nanobot swarm that has "abundant flexibility" to change shape as needed. Descending through the Martian atmosphere, for example, it could form an aerodynamic shield. On the ground, it could become a snake to slither over difficult terrain. It could grow an antenna to send back data on anything interesting it encounters. It also would heal itself if damaged. Human bodies replace damaged cells with new ones, notes Steven Curtis, lead researcher for ANTS. "In a similar way, undamaged units in a [nanobot] swarm will join together, allowing it to tolerate extensive damage and still carry on its mission," he says.

Source: "A tiny robot swarm - fiction no longer", Christian Science Monitor, Robert C. Cowen, 4/7/2005

While outsourcing will continue, employment in the US will continue to offer ample opportunities for software developers and other IT professionals.

Not all tech jobs collapsed with the economy. Some thrived through the recession, new research shows. IEEE-USA, a branch of the Institute of Electrical and Electronics Engineers, recently sifted

through federal data to look at employment changes for six major technical fields from 2000 to 2004. Overall, it found that IT employment fell by more than 220,000 positions over the four-year period. But the declines weren't across the board. Three fields – computer hardware engineers, computer and information systems managers, and computer software engineers – added jobs. Computer programmers, computer scientists and systems analysts, and electrical and electronics engineers lost jobs. "Some industries and fields are bringing in people, and others are still downsizing," said Paul Kostek, head of IEEE-USA's Career and Workforce Policy Committee. IEEE-USA isn't the only group highlighting the growth specialties.

In its January issue, Fast Company magazine ranked and published a list of the 25 top jobs for 2005 based on job growth, salary potential, education level and the amount of creativity and innovation available to workers in that field. Among the 25 were computer software engineers. "The software industry grew 6 percent in 2004 alone," the magazine said. "Normally, a bachelor's degree in computer engineering or science is sufficient to get a good position, meaning the job ranks high on the education index but not quite at the top." It added, "The profession is well-paying but only a gold mine for those with unique, specialized skills."

Source: "A few tech fields added positions during downturn", Dallas Morning News, Victor Godinez, 3/16/2005

US programmers are falling behind.

American universities -- once the dominant force in the information technology world -- fell far down the ranks in a widely watched international computer-programming contest. The University of Illinois tied for 17th place in the world finals of the Association for Computing Machinery International Collegiate Programming Contest. That's the weakest result for the United States in the 29-year history of the competition. This year, the contest was held in Shanghai, where a home team, Shanghai Jiao Tong University, won. Two Russian institutions, Moscow State University and St. Petersburg Institute of Fine Mechanics and Optics, came in second and third. Canada saved North America's honor, as Ontario's University of Waterloo took the No. 4 spot.

While the United States slips, China's technology skills are rising, South Korea is the leader in broadband data transmission and India is becoming the world's programming hub. Europe, which also did well in the contest, is ahead of the United States in online mobile telephone service.

"The educational system has done a demonstrably poor job of (teaching) technical, scientific and computing," said Georgia Institute of Technology Professor Jim Foley, chairman of Computing Research Association

Source: "American universities fall behind in programming", San Francisco Chronicle, Birgitta Forsberg, 4/9/2005

Competition Trends

The corporate for-profit model post secondary school is the fastest-growing areas of the \$315.5 billion postsecondary market in North America.

The growth of for-profit schools is hard to ignore. Corporations have made the for-profit market one of the fastest-growing areas of the \$315.5 billion postsecondary market in North America, according to U.S. Department of Education figures. Career Education Corp. also saw similar growth, reporting total revenue for the nine months ended Sept. 30 of \$1.3 billion. This was a 53 percent jump from \$817.3 million for the previous period. Student population on its 82 campuses in North America, Europe and the Middle East rose more than 22 percent to 97,300 in 2004. DeVry reported total revenue of \$784.8 million for the period ending in June, compared with \$679.5 million for 2003.

Work-force impact

As a formidable player in the education field, for-profit education is becoming an influential force in work-force training, offering options for mid-career training as well as practical, employment-focused preparation for the real world. The emphasis at these and other for-profit schools tends to be on preparing students for employment. "The overall market for educational services is doing quite well," said Jeff Humphreys, director of the Selig Center for Economic Growth at The University of Georgia. "There's high and growing demand for educational services in general, and that's creating opportunities not just for traditional players, but for nontraditional players as well."

The for-profits have also been quick to adopt innovations such as online learning, evening degree programs, and condensed programs that get students into the job market faster. Students at DeVry University can enroll at any of the school's seven Atlanta locations in addition to taking courses through the online division.

Many of the schools also make use of advisory committees made up of working professionals in a particular profession. These groups review courses and curriculums to ensure students are receiving the kind of training employers expect from new workers. "It's important that we're able to help the students through their education as well as helping them toward employment," said Jeanne Johnson-Whatley, DeVry's director of university outreach. "That's why we select areas or careers that have some growth potential."

Source: "The business of education", <http://www.bizjournals.com/industries/>, Randy Southerland, 1/17/2005