

Work.

Thriving in a Turbulent, Technological and
Transformed Global Economy



Compete.

Council on
Competitiveness

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Transformed Global Economy



Letter from the President

Since its founding, the Council on Competitiveness has emphasized the key linkage between workforce skills and U.S. competitiveness, and analyzed emerging trends affecting the American workforce. Armed with this insight, the Council has engaged with stakeholders across the Nation to promote new approaches to ensuring a competitive workforce that can unleash American innovation and sharpen the U.S. competitive edge, leading to increased productivity, greater prosperity and higher standards of living.

The Council's landmark National Innovation Initiative (NII) and action agenda—*Innovate America: Thriving in a World of Challenge and Change*—identified “talent” as one of three fundamental drivers of innovation and competitiveness. Innovate America set forth an agenda to build the U.S. base of scientists and engineers, catalyze the next generation of American innovators and empower U.S. workers to succeed in the global economy.

Building on the NII, the Council has remained focused on America's workforce through a series of dedicated initiatives and reports on topics such as 21st century manufacturing, energy and cutting-edge technology. In each of these efforts, the Council has emphasized the critical importance of education and workforce development. *Work* looks across these initiatives and reports, highlighting some of the many recommendations to strengthen America's workforce that emerged from this body of research, analysis and dialogue between U.S. business, education, technology and labor leaders.

Work also reviews important long-term trends affecting the U.S. labor market, and the challenges and opportunities they present for America's workers. Shifting drivers of the U.S. economy, globalization and technological change are significantly affecting jobs



and the skills in demand. American workers are creative, industrious risk-takers and among the world's most productive. But many lack the education and skills needed to secure high-paying jobs in the fast-paced, knowledge-based, technology-intensive global economy that has evolved in the United States.

The recommendations in *Work* offer a roadmap to align U.S. education and training to 21st century skill needs, leverage our intellectual capital more effectively, supply our businesses with the talent needed to compete globally, and enable America's most valuable competitive asset—our people—to apply their creativity and effort toward productive, prosperous lives.

Sincerely,

A handwritten signature in black ink that reads "Deborah L. Wince-Smith". The signature is fluid and cursive.

Deborah L. Wince-Smith
President & CEO
Council on Competitiveness

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Radical Changes in the Landscape for America's Workforce

American workers have struggled with a historically slow recovery from the great recession. However, long-term trends are also affecting the American labor force in fundamental ways. U.S. workers are caught up in a turbulent economy being transformed by globalization, shifts in economic drivers, and the rapid advance of digital technologies. Up and down the career ladder, and across the workforce landscape, mega trends are affecting U.S. labor markets, the occupational mix in the country, what people do on the job and the skills they need to compete and succeed in a fiercely competitive global marketplace.

With the continued rapid evolution of technology and global commerce, the cycle of job creation, growth and destruction will continue into the future. The task ahead for Americans is to: (1) understand the economic and technological forces driving productivity and shaping the demand for high-value skills, and (2) develop a diversely skilled and adaptable American workforce that can match or exceed the academic, entrepreneurial and technical capabilities of workers in other countries.

Drivers of the Economy Have Changed, Creating Demand for Higher Skills

The primary drivers of the U.S. economy have radically changed. In the 19th century, agriculture and mineral extraction drove prosperity based on natural resources. In 1862, U.S. farms employed almost 60 percent of the U.S. labor force, and agriculture accounted for about 40 percent of U.S. gross domestic product (GDP). By the 1990s, farms employed only 3 percent of the labor force.¹

Mass production drove 20th century America with machinery and capital. Manufacturing enterprises operated production facilities designed to deliver standard products at low cost. They were staffed with workers with relatively fixed job responsibilities and narrowly defined tasks.

In 1960, the manufacturing sector's share of U.S. GDP was about 27 percent; today its contribution to GDP is about 12 percent.² In 1979, at its peak headcount, the U.S. manufacturing sector employed 19.4 million people. In 2014, manufacturing employed about 12 million people and accounted for 9 percent of U.S. non-farm employment.³

In the 21st century, knowledge, technology and innovation drive the economy. For example, 35 years ago about 80 percent of the market value of the S&P 500 was represented by tangible assets—brick, mortar, equipment and inventory. Today, about 80 percent of the value is represented by intangible assets—patents, trademarks, brands, research and software.⁴ Increasingly, competitive and market success depend on people working with these intangible, idea-based assets and the technologies and management systems used to create value from them.

Another way to look at the current U.S. economy is the major role played by knowledge and technology-intensive (KTI) industries. These include commercial knowledge-intensive business, financial and telecommunication services (including computer software and R&D); the knowledge-intensive public education and health services industries; and five

1. Colleges of Agriculture at the Land Grant Universities, National Academies Press, 1996.

2. U.S. Department of Commerce, Bureau of Economic Analysis.

3. Employment, Hours, and Earnings, Current Employment Statistics Survey (National), Bureau of Labor Statistics.

4. <http://www.oceantomo.com/about/intellectualcapitalequity>.

high technology manufacturing industries—aircraft and spacecraft, communications equipment and semiconductors, computers and office machinery, pharmaceuticals and testing, measuring, and control instruments. These industries incorporate high technology either in their services or in the delivery of their services, or spend a large proportion of their revenues on R&D and make products that contain or embody technologies developed from R&D.⁵

The United States has the highest concentration of KTI industries among major economies, accounting for 40 percent of U.S. GDP. In 2014, these industries accounted for 29 percent of U.S. non-farm employment.⁶

Not surprisingly, the U.S. KTI industries have a higher-than-average share of skilled workers. In these industries, both the share of jobs that typically require an associate's degree or higher, and the share of jobs in knowledge-related occupational groups are higher, or significantly higher, than in manufacturing and the economy generally.

These long-term shifts in drivers of the economy have spurred radical changes in occupational staffing patterns. Of 11 major occupational groups listed in the 1950 census, professional, technical and kindred workers had the largest percentage and numeric increase, rising from ninth largest to the largest occupational group. The five major occupational groups that increased include mostly occupations that work with information, ideas or people; and, at least for professional and managerial occupations,

have higher-than-average education requirements. In aggregate, the five groups that increased grew from 24 percent to 75 percent of total employment.⁷

Hyper Labor Competition to Perform the World's Work

Riding the tidal wave of transformation brought about by the fall of the Iron Curtain, globalization, trade liberalization and the digital revolution, billions of people in emerging economies have entered global commerce and swelled the global labor pool. The effective global labor supply quadrupled between 1980-2005, with most of this increase occurring after 1990.⁸ For example, the four BRIC nations—Brazil, Russian, India and China—now represent 45 percent of the world labor supply, compared with less than 20 percent living in OECD countries.⁹

Today, many educated and skilled people in emerging economies compete to perform the world's work, often for lower than or comparable wages to their counterparts in advanced nations such as the United States. Just as they have new tools to reach markets around the world, employers—of all sizes, domestic and foreign—access the global labor pool through many channels. Employers tap global talent by: (1) offshoring or establishing new foreign operations, (2) moving routine rule-based work that can be digitized over telecommunications networks, (3) assembling global project teams and (4) hiring talent through temporary worker visa programs.

5. Defined and classified by the Organisation for Economic Co-operation and Development.

6. Table B-1a., Employees on Nonfarm Payrolls by Industry Sector, Current Employment Statistics, Bureau of Labor Statistics.

7. Occupational Changes During the 20th Century, Monthly Labor Review, March 2006.

8. World Economic Outlook, Spillovers and Cycles in the Global Economy, April 2007, International Monetary Fund.

9. Globalisation, Jobs and Wages, Policy Brief, OECD, June 2007.

Offshoring work once done in the United States—part of a larger trend in the growth of enterprises operating globally—has been driven by advances in telecommunications, widespread computerization, digitization of some work and services and the availability of relatively well educated, English-speaking workers in other nations who perform work at lower costs. Some of the cost differentials reflect differences not only in wages, but also skills and productivity, and the relatively lower complexity of work being performed.¹⁰ The labor force in many of these emerging economies has relatively lower productivity than in the United States, as measured by GDP per hour worked.¹¹ Beyond the cost of labor, the total cost of operation can include land, energy, taxes, regulation, transportation, currency rates, intellectual property theft and other factors. The impact of such factors varies by industry and firm, and affects where operations are located.

The nature of the tasks workers perform plays a key role in the level of risk that the job will be offshored. A Bureau of Labor Statistics analysis identified 160 service-providing occupations that are susceptible to offshoring.¹² Those most susceptible include office and administrative support occupations with relatively low education or training requirements—such as telephone operators, computer operators, data entry keyers, typists, payroll clerks and medical transcriptionists—but also professional and related occupations, which have higher educa-

tional requirements—such as credit analysts, insurance underwriters, pharmacists, financial analysts, biochemists and physicists.

The group of occupations found least susceptible consists largely of highly skilled occupations, most of which are professional occupations or management, business and financial operations occupations, including a range of managers (from public relations and marketing managers, to financial and operations managers), and a variety of engineers. While jobs most susceptible to offshoring have a range of education and training requirements—from short-term on-the-job training to doctoral degree, but mostly some level of on-the-job training—almost all of the jobs least susceptible to offshoring require a bachelor's degree or higher. Another characteristic of jobs least susceptible to offshoring are those in which work is performed on site, such as health and safety engineering, mining and geological engineers, urban and regional planners, and landscape architects.

Work that can be routinized or handled by following a script is more susceptible to offshoring because work outputs and work processes are easier to define and monitor. By contrast, work that is more creative is more difficult to monitor, making companies less likely to have it performed from remote locations.¹³ Generally, if a problem can be solved by a rule or a task performed with a straightforward process, a computer (or someone using a computer

10. Embracing the Challenge of Free Trade: Competing and Prospering in a Global Economy, Chairman Ben S. Bernanke, at the Montana Economic Development Summit, 2007, Board of Governors of the Federal Reserve System, May 1, 2007.

11. OECD (2015), GDP Per Hour Worked (indicator).

12. Service-providing Occupations, Offshoring, and the Labor Market, Monthly Labor Review, December 2008.

13. Service-providing Occupations, Offshoring, and the Labor Market, Monthly Labor Review, December 2008.

in a developing economy) will be able to do it.¹⁴ However, data security and protection of intellectual property are concerns.

Labor Market Polarization

Labor markets in the United States and other advanced economies are becoming polarized—demand has grown for high-end workers for jobs involving non-routine cognitive tasks and for low-skill/high-touch workers, but is weak for many middle-skill workers.¹⁵ While low-skilled and high-skilled occupations have increased their share of employment over the past two decades, the employment share of middle skill jobs has declined.¹⁶

Non-routine manual jobs require little formal education, but require skills—sometimes substantial skills developed through significant on-the-job training, technical school or apprenticeship—for in-person interactions and hands-on tasks. Examples include home health care or janitorial jobs, or jobs in skilled trades such as plumbers, pipefitters and HVAC mechanics and installers, who work in factories, homes and businesses where there are pipes, septic systems and HVAC systems. These are hard to automate or offshore. As a result, the demand for these workers is generally high.

At the opposite end of the occupational skill distribution, demand for high-skill labor to perform non-routine cognitive tasks has grown rapidly. Non-routine cognitive tasks involve abstract thinking, analytical and problem solving work where there is no rule-based solution, complex work that varies case-by-case and complex communications.¹⁷

Jobs that include this type of non-routine work involving complex tasks are growing two and half times faster than jobs involving routine tasks and three times faster than jobs in the overall economy, and now make up about 40 percent of the U.S. workforce.¹⁸ This kind of work often requires higher levels of education. Employment share in both manufacturing and non-manufacturing industries is rising for those with some college or a college degree, and has declined for those with a high school diploma or less.¹⁹

In the middle are those workers with intermediate skills employed in routine jobs—from manufacturing assembly line workers to office clerks—who perform procedural rule-based tasks that are easier to ship offshore to countries with lower wages, or easier and more attractive to automate as the cost of automation falls.²⁰

14. How Computerized Work and Globalization Shape Human Skill Demands, by Frank Levy, MIT and Richard Murnane, Harvard University, May 31, 2006.

15. Labor-Market Polarization Over the Business Cycle, Christopher L. Foote and Richard W. Ryan, Federal Reserve Bank of Boston, December 6, 2012.

16. The Polarization of Job Opportunities in the U.S. Labor Market: Implications for Employment and Earnings, David Autor, MIT Department of Economics and National Bureau of Economic Research, April 2010, <http://economics.mit.edu/files/5554>.

17. How Computerized Work and Globalization Shape Human Skill Demands, by Frank Levy, MIT, and Richard Murnane, Harvard University, May 31, 2006.

18. The Next Revolution in Interactions, by Bradford C. Johnson, James M. Manyika, and Lareina A. Yee, McKinsey Quarterly, November 2005.

19. Economics and Statistics Administration, U.S. Department of Commerce Calculations using Current Population Survey data, National Bureau of Economic Research.

20. The Polarization of Job Opportunities in the U.S. Labor Market: Implications for Employment and Earnings, David Autor, MIT Department of Economics and National Bureau of Economic Research, April 2010; Labor-Market Polarization Over the Business Cycle, Christopher L. Foote and Richard W. Ryan, Federal Reserve Bank of Boston, December 6, 2012; and Job Polarization Leaves Middle-Skilled Workers Out in the Cold, Maria E. Canon and Elise Marifian, The Regional Economist, Federal Reserve Bank of St. Louis, January 2013.

The shift from routine jobs to manual and cognitive non-routine jobs is spreading across the economy, intensifying the polarization of employment opportunities in the United States. This polarization goes beyond a shift in the sector composition of employment in the economy (i.e. just job losses in manufacturing); it is a shift in the occupational mix within all industries.²¹

These trends can also be seen in higher rates of employment growth for those with higher education, and job losses for those with a high school diploma or less. This gap has been widening.

The wage gap between those with higher education and less education is also widening. Since the 1980s, the average wage for college graduates has increased from about one and a half times the wage for workers with only a high school degree to about two times their wage.²² Data from the Bureau of Labor Statistics, for example, show that among full-time workers age 25 and over, those holding a bachelor's degree but no advanced degree earned about \$1,100 per week in the second quarter of 2013 compared with about \$650 per week for those with a high school diploma and no college.²³

Wage premiums for higher educational attainment are not unique to the United States. The relative earnings premium for those with a college education increased in most OECD countries over the past ten years. Among OECD countries, Chile, Hun-

gary, Slovenia, and the United States have the highest earning premiums for university-level educated workers.²⁴

The Digital Revolution and Rise of Machines

Private investment in digital equipment and software has grown significantly over the past two decades. Over the past 25 years, investment in digital equipment and software has grown an average of more than 5 percent annually, and growth was particularly strong from 1992-2000 when investment grew an average of almost 12 percent annually. Today, private investment in information processing equipment and software exceeds \$600 billion annually.

Widespread computerization and telecommunications networking across global business and industry has transformed work—the ways in which, and the speed with which, people connect, collaborate, design and build, locate and manage resources, manipulate tools, conduct research, analyze and forecast, reach markets, move and track products, make transactions and perform a myriad of other daily work tasks.²⁵

The IT revolution not only has allowed workers to “crank” the machine faster, but also created opportunities to fundamentally change the way production and service delivery are organized, and the way work organizations operate. Mobile handheld devices take computing power where workers go, decoupling work from desktop and place. Social networks and

21. Job Polarization Leaves Middle-Skilled Workers Out in the Cold, Maria E. Canon and Elise Marifian, The Regional Economist, Federal Reserve Bank of St. Louis, January 2013.

22. Governor Daniel K. Tarullo, Unemployment, the Labor Market, and the Economy, Remarks at the World Leaders Forum, Columbia University, Board of Governors of the Federal Reserve, October 20, 2011.

23. Labor Market Lessons from Occupational Colleges, Lawrence H. Leith, Monthly Labor Review, October 2013.

24. Country Note, United States, Education at a Glance 2013. OECD Indicators.

25. Futurework: Trends and Challenges for Work in the 21st Century, U.S. Department of Labor, 1999.

peer-to-peer knowledge sharing software are becoming drivers of workplace productivity—not simply social ones. High-performance computing, coupled with “big data” and the “Internet of Things”—vast clouds of interconnected devices and sensors—are allowing real-time and deep analysis across fields ranging from scientific research and the electricity grid, to consumer marketing and manufacturing.

Machines, autonomous systems, sensors and software are increasingly capable of doing routine tasks that have made up jobs for millions of Americans. For example, Internet systems provide customers with account information and payment processing. Tax preparation software carries out work once performed by accountants. Financial institutions use software to assess credit risk. Sensors and imaging technologies perform security functions. More powerful computers, “big data,” advances in natural language processing and user interfaces are likely to augment performance in some high skilled jobs, but allow for the automation of others.²⁶

Digital technologies have also enabled the practice of breaking down jobs into tasks, sorting repetitive, rule-based tasks from more complex tasks; the routine tasks may then be automated or performed in low cost locations around the world.²⁷

The price of automation has fallen significantly in the past few decades, both in absolute terms and relative to the cost of labor.²⁸ As the cost of labor rises

and the cost of automation declines, it becomes more attractive to automate work and eliminate some jobs.

While many lower-skilled workers perform tasks easier to automate, or tend to use technology that reduces the skills needed on the job, technology tends to favor those with higher skills.²⁹ High-skill workers use technology to enhance their capabilities, for example, using computers to write, perform research, design products and deliberate with others³⁰.

Rapid Technological Change and Disruption

Disruptive technologies and innovations can drive a reordering at every level of the economy—from the workplace, to the labor market, to the mix of industries in a community or country—creating new opportunities for some workers, but also hardships for others. The process of reorganization may create new jobs while eliminating others, create new occupations, or change the occupational mix, tasks to be performed and the skills in demand. For example, digital technologies drove the creation of new industries, created new occupations and many new jobs, but also undermined jobs in other industries and occupations.

26. The Future of Employment: How Susceptible Are Jobs to Computerisation, by Carl Benedikt Frey and Michael A. Osborne, University of Oxford, September 17, 2013.

27. An Economy that Works: Job Creation and America's Future, McKinsey Global Institute, June 2011.

28. Job Polarization Leaves Middle-Skilled Workers Out in the Cold, Maria E. Canon and Elise Marifian, The Regional Economist, Federal Reserve Bank of St. Louis, January 2013.

29. How Computerized Work and Globalization Shape Human Skill Demands, by Frank Levy, MIT, and Richard Murnane, Harvard University, May 31, 2006.

30. The Missing Middle: Aligning Education and the Knowledge Economy, by Anthony Carnevale and Donna Desrochers, Educational Testing Service, April 2002.

Disruption is ongoing. Today, Uber drivers are disrupting the work of traditional taxi drivers. Digital photography has disrupted the film industry, and mobile phones and YouTube are impacting broadcasting. Netflix is challenging cable and broadcast entertainment models, while iTunes is reordering the music industry.

For the United States to leverage rapid advances in technology, especially revolutionary enabling technologies, for their highest economic benefit and productivity gains, businesses must be able to reorganize themselves in ways that take advantage of new technologies and drive transformation in industry and the economy. Labor markets must be flexible to allow for the rapid reallocation of human capital in response to changes in demand.

Higher-skilled workers are not only at a premium when new technologies are introduced, because they are better able to use them, they are also better prepared to move to new industries, new jobs, new occupations or new skills when displaced by technological, labor market or market disruptions.³¹

Bottom Line for U.S. Workers

The shift in drivers of the economy, advances in technology and the nature of tasks people do on the job have placed a premium on workers who possess the high skills, knowledge and know-how that drive service and product innovation, who can engage with customers and other workers to accomplish organizational goals and who can perform complex non-routine tasks.

As we move from a “brute force” to a “brain force” economy, the markets for intellectual capital are growing and employers look regionally, nationally and globally for top talent, top project teams and locations rich with talent for their business investment. In today’s technology- and information-driven economy, skills are the name of the game, and those who invest in education and skills development are more competitive in the workforce, earn more, have lower risk of unemployment and propel the next generation of prosperity.

31. How Economies Grow, The CED Perspective on Raising the Long-Term Standard of Living, Committee for Economic Development, May 2003; International Capital Flows and the Emerging Market Economies, Speech by Governor Randall Kroszner, (at the Central de la Republica Argentina Seminar), Board of Governors of the Federal Reserve System, May 15, 2007.

Answering the Challenges of New Workforce Realities

The trends discussed in WORK highlight the employment realities of today's highly productive, dynamic, technology- and information-driven economy. Education and skills are essential for success and those who invest in developing them will be more competitive in the labor market and more successful transitioning as technological change or market forces disrupt labor markets. The long-term, widening gap in income growth across levels of educational attainment places education and skills center stage for securing prosperity for Americans and reducing income inequality.

America has the ability to address some of the challenges brought by new realities of the labor market, the workforce and the workplace. The United States must develop strategies to prepare the workforce to adapt to rapid change and to reach for high-wage, non-routine cognitive jobs. Every aspect of our education and training system, from K-12 to workforce development, must function well to prepare the full spectrum of our workers—high school and college graduates, adult workers and mature workers—with the skills they need to compete in the 21st century economy.

As stewards of the future, it is incumbent upon America's leaders in government, industry, institutions of education and labor organizations to cultivate an agile and resilient workforce able to withstand the storms of change and adapt during the droughts of recession. America's true competitiveness rests in its ability to efficiently allocate productive resources including the adaptability of our workforce.

National Skills Agenda

- Establish a National Skills Agenda
- Build Foundations for Success in a High Skill Knowledge- and Technology-Driven Economy
 - Get Ready for the Workplace By Encouraging Real-World Skills and Experience
 - Develop Science and Engineering Skills, and a Science and Engineering Workforce for the New Economy
 - Nurture the Next Generation of Entrepreneurs
- Skill-up for the Energy Revolution and Sustainability
- Expand Access to and Transform Systems for Acquiring Work Skills
 - Support Technical and Professional Skills Development
 - Establish New Pathways to Transition Veterans into the Workforce
 - Keep Mature Workers Competitive in the Labor Market and Productive in the workplace
 - Develop Better Labor Market Information Systems

Recommendations

Establish a National Skills Agenda

- Establish a U.S. National High Skills Agenda, complementing the Strategy for American Innovation and National Strategic Plan for Advanced Manufacturing, to help ensure employability for Americans in an era of rapid change and increasing demand for high skills.

Build Foundations for Success in a High-Skill, Knowledge- and Technology-Driven Global Economy

Get Ready for the Workplace by Encouraging Real-World Skills and Experience

- Initiate K-12 pilots and programs that emphasize team-based, experiential and inter-disciplinary learning geared toward problem solving.
- Renew the commitment to broad education. For example, reinstate classes such as shop, art, music and other skills-based areas of study in middle and high school curricula to encourage creativity, skills acquisition and self-efficacy.
- Begin academic and career planning at a much earlier stage to give students an opportunity to explore and develop their passions, and plan for the future.
- Increase experiential education through internships, using the workplace as a venue for education, and providing students of all ages with practical experience and development of relevant skills.
- Replicate best practices from disciplines such as health care to make work experience mandatory at the secondary and post-secondary education levels.

- Develop more students and workers with global perspectives. Academia, industry and government should launch the “American Explorers Initiative” to send more Americans abroad to study, perform research and work in global businesses. Expand the Fulbright Program to include undergraduate students.

Develop Science and Engineering Skills, and a Science and Engineering Workforce for the New Economy

- Ensure primary and secondary level students have access to teachers who are STEM subject matter experts to better educate and inspire students to pursue advanced STEM education, career opportunities and the application of STEM in a wide range of occupations.
- Develop flexible paths to help achieve STEM literacy and STEM skills, such as through community colleges, vocational trade schools and work training programs.
- Link STEM higher education to projected job opportunities of the future.
- Develop scientists and engineers who are multidisciplinary. Expose or train scientists and engineers beyond a traditional single discipline to produce more inter- and multi-disciplinary STEM professionals, including providing opportunities for cross-disciplinary collaborations with fields outside of science and technology, such as business and humanities.
- Establish reward structures at educational institutions to encourage cross-disciplinary interaction among students and in the development of STEM professionals. Organize more university R&D and science and engineering training around grand challenges.

- Rethink traditional paths for students who want to study engineering and STEM at liberal arts schools.
- Ensure scientists and engineers are introduced to key commercialization knowledge in areas such as design, technology development, project management, finance, manufacturing, business development, entrepreneurship and marketing.
- Expand efforts to train more computational scientists and engineers across numerous fields to better leverage America's IT advantage. This includes training and attracting more individuals skilled in developing and applying modeling and simulation software.
- Develop a "CyberCorps" program to train more professionals to help governments, companies and other organizations fight cyber intrusions, cyber espionage and theft, and other cyber crime.
- Cultivate industry partnerships with academia so scientists and engineers in training can work on real-world, interdisciplinary problems.

Nurture the Next Generation of Entrepreneurs

- Promote programs that inspire students to pursue entrepreneurship.
- Prepare the next generation of innovators by fostering entrepreneurial talent at all career stages, especially early in the training of students in science, engineering, business and law.

Skill-up for the Energy Revolution and Sustainability

- Skill-up for sustainability. Teach and develop skills in sustainability to increase U.S. workers' competitiveness as sustainability rises on the corporate agenda and becomes a greater factor in global hiring and investment.
- Skill-up for the energy revolution. Commit one percent of Federal agencies' R&D budgets to competitive, portable, undergraduate and graduate fellowships in energy-related disciplines for U.S. students. Establish a U.S. Department of Energy permanent early career research program to support top emerging energy scientists and engineers at U.S. universities and national laboratories.
- Offer Federal scholarships to U.S. post-secondary students who commit to a minimum period of service in an energy-related career in the governmental, academic or non-profit sectors.
- Classify and widely publicize demand-driven needs for energy-related occupations, through the Department of Labor and align government resources to support skills training in these energy fields.
- Create a \$300 million "Clean Energy Workforce Readiness Program" at the Department of Labor to foster partnerships with industry, educational institutions, workforce organizations and the military.

Expand Access to and Transform Systems for Acquiring Work Skills

Support Technical and Professional Skills Development

- Develop programs that expose students at the secondary and post-secondary education levels to opportunities in the skilled trades, and provide vocational and technical training to better prepare them for apprenticeships and other employment opportunities when they enter the workforce.
- Elevate Career and Technical Education (CTE) programs as priorities for Federal, state and local governments, along with high schools, universities, community colleges, national laboratories and industry. Strengthen them through partnerships with business or labor that prepare students and workers for good jobs that fill labor market needs.
- Integrate academic education and technical training programs across universities and community colleges to ensure that students who participate in CTE programs are taught to rigorous standards aligned with technical and industry requirements, while maintaining their options to pursue formal higher education degree programs. This includes establishing flexible pathways for advanced degree acquisition.
- Establish a portable CompetePass available at Department of Labor one-stop training centers that can be used by eligible workforce entrants, unemployed and incumbent job holders to secure skills in certified employer-, academic- or labor-sponsored training programs that meet industry-driven skills requirements in high growth job sectors.
- Form partnerships—among Congress, the Administration, industry, academia and labor—to establish a strong manufacturing skills training capability in the development of the national network of advanced manufacturing clusters.
- Develop state-of-the-art apprenticeship programs for 21st century manufacturing in concert with industry and labor leaders. This includes launching a national manufacturing apprenticeship program operated through shared staffing and financial contributions from labor and industry.
- Community colleges should work with employers to target specific skills gaps and develop and provide accelerated training to unemployed and transitioning workers, as well as filling the immediate needs of business.
- Base stackable credentials on competency and experience rather than classroom credit to maximize training efficiency and encourage adult learners to further their education and training.
- Build effective public-private partnerships in which community colleges collaborate with state and regional governments and local industry to create degree and training programs that support economic development efforts, business recruitment and business growth.
- Explore successful skill development models for small and midsize business-pooled workforce training programs. Joining forces to address skills needs can allow smaller businesses to scale and tailor training programs to meet the wide array of requirements for present and anticipated talent.

Establish New Pathways to Transition Veterans Into the Workforce

- Establish a Federal “Veterans in Manufacturing Program” to create opportunities for America’s soldiers. Create a public-private partnership through the Department of Defense to identify opportunities for newly returning and older veterans to skill up for the manufacturing workforce.
- Expand programs such as Helmets to Hardhats® and project labor agreements/community workforce agreements to hire and train active military personnel, disadvantaged youth and unemployed veterans for successful careers in the skilled trades.

Keep Mature Workers Competitive in the Labor Market and Productive in the Work Place

- Revise the Workforce Investment Act to establish public-private partnerships to provide skills assessments, training and career advisory services to mature job seekers.
- Encourage postsecondary institutions to offer education and training options that address the needs of mature workers, including offering education and training at times, in places and with curricula delivery that are accessible to mature people who are working full time.
- Design job-training programs to support mature workers who are in the workforce (as opposed to programs that target new workforce entrants or the unemployed). This includes offering training and job placement services at times and in places that are accessible to mature people who are working full time.

- Provide incentives for co-op and internship programs for mature workers.
- Develop new tools and initiatives at regional workforce entities and improve systems to connect mature workers to new career pathways in high-demand, high-wage jobs.
- Offer advice, networking events, resources and services to mature workers at the regional level.
- Integrate new mature worker initiatives into economic development strategies and programs.

Develop Better Labor Market Information Systems

- Create stronger feedback loops for industry to communicate its needs to educators, students and job seekers, for example, through industry advisory committees, surveys of employers, having industry professionals serve as part time faculty and faculty participation in industry conferences and symposia.
- Universities, community colleges and other education institutions should be more proactive in identifying and adapting to the needs of employers and current and future workers.
- Increase opportunities for experiential learning, such as internships, to provide students with a better understanding of the needs in industry and the workplace.

Council on Competitiveness Workforce Leadership Initiatives and Reports America's Workforce as Critical Competitive Driver

- 2013** ***Global Manufacturing Competitiveness Index***
Identifies “talent-driven innovation” as top driver of manufacturing competitiveness benchmarks U.S. talent-driven innovation against other countries.
- 2012** ***Accelerating and Innovating Workforce Development***
From the “Out of the Blue” dialogue held at Lehigh University and Air Products, discusses how to educate and motivate workers for jobs in 21st century manufacturing.
- 2012** ***Leveraging Talent Development to Drive Innovation***
From the “Out of the Blue” dialogue held at Snap-on Tools, discusses workforce challenges in and developing skills for 21st century manufacturing.
- 2011** ***Developing the Workforce as It Matures***
Profiles efforts across the country to help mature workers access training and job opportunities to return to work or continue working in a different capacity.
- 2011** ***Technology Leadership and Strategy Initiative***
Working group on talent addresses key role of workforce in U.S. technology leadership, and includes recommendations on better leveraging and enhancing that role.
- 2011** ***MAKE: An American Manufacturing Movement***
Highlights how a new era of manufacturing excellence offers hope for good jobs and how to harness the power of talent to revitalize American manufacturing.
- 2011** ***Ignite 3.0: Voices of American Labor Leaders on Manufacturing Competitiveness***
Discusses developing America's workforce for the 21st century and the role of American workers in U.S. manufacturing competitiveness.
- 2011** ***Ignite 2.0: Voices of American University Presidents and National Lab Directors on Manufacturing Competitiveness***
Discusses the critical importance of attracting, developing and retaining top science and engineering talent to drive world-class innovation and R&D, and the need to build strong STEM skills in American students.
- 2010** ***Bridging the Skills Gap: Why Mature Workers Matter***
Examines the critical role of mature workers in the American economy, and discusses ways to extend the working lives of the baby boom generation.
- 2010** ***Regional Economic and Workforce Strategies: A Focus on the Mature Workforce***
Reviews strategies and programs that regional leaders might consider to help mature workers transition to jobs that meet the needs of workers and employers.

- 2009** ***Mobilizing a World Class Energy Workforce***
Recommendations on building an energy workforce of sufficient size and capabilities to meet the needs of a sustainable, secure energy system.
- 2009 ***Drive. Private Sector Demand for Sustainable Energy Solutions***
Explores the potential for creating millions of new jobs through development of sustainable energy products and services, and outlines steps the United States can take to develop a workforce for a transformed energy system.
- 2008** ***Thrive. The Skills Imperative***
Analyzes key trends underpinning future workforce skills challenges and opportunities in the United States, demonstrating the urgent need for a national skills agenda.
- 2008** ***The Talent Imperative for Older Industrial Areas***
Explains the role of talent in regional economic development, and suggests approaches for regions to develop, retain and attract skilled workers, with a focus on policies and programs for older industrial areas.
- 2008** ***Cooperate***
A practitioner's guide for effectively aligning regional development and education through partnerships among K-12 schools, community colleges, adult education centers, universities, regional employers, and economic and workforce development organizations.
- 2007** ***Five for the Future***
Discusses the role of diversity, talent and creativity in innovation and competitiveness.
- 2007** ***Where America Stands: Entrepreneurship***
Benchmark analysis that looks at America's entrepreneurs.
- 2007** ***Competitiveness Index: Where America Stands***
Benchmark analysis on the global supply of professional labor, earnings and returns to education, work participation rates, workforce diversity, job churn, employment growth, unemployment, worker productivity, the science and engineering workforce, educational attainment and job training.
- 2005** ***Innovate America: Thriving in a World of Challenge and Change***
Groundbreaking action agenda to improve U.S. innovation capacity, including strengthening the U.S. talent base for research, innovation and commercialization.

About the Council on Competitiveness

Who We Are

Founded in 1986, the Council on Competitiveness is a non-partisan leadership organization of corporate CEOs, university presidents, labor leaders and national laboratory directors committed to advancing U.S. competitiveness in the global economy and a rising standard of living for all Americans.

Dedicated to building U.S. prosperity, the Council plays a powerful role in shaping America's future by setting an action agenda to assess U.S. competitiveness, identify emerging forces transforming the economy, catalyze thought leaders who drive change and galvanize stakeholders to act.

Council on Competitiveness
900 17th Street, NW, Suite 700
Washington, D.C. 20006, USA
T 202 682 4292
F 202 682 5150
www.compete.org

How We Operate

The key to U.S. prosperity in a global economy is to develop the most innovative workforce, educational system and businesses that will maintain the United States' position as the global economic leader.

The Council achieves its mission by:

- Identifying and understanding emerging challenges to competitiveness
- Generating new policy ideas and concepts to shape the competitiveness debate
- Forging public and private partnerships to drive consensus
- Galvanizing stakeholders to translate policy into action and change

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900 17th Street, NW, Suite 700 Washington, D.C. 20006 T 202 682 4292

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