The Case for Enhancing American Workforce Skills

Summary and Analysis of Recent Research Findings and Authoritative Commentary

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NACFAM is an industry-led, non-profit 501(c)(3) education, research, and services organization committed to enhancing the productivity and competitiveness of U.S.-based manufacturing. NACFAM's goal is the accelerated development and deployment of advanced technologies and related workforce skills and knowledge within all tiers of the U.S. industrial base.

NACFAM provides leadership in developing public policies and programs in areas directly related to the manufacturing process; increased R&D investment in manufacturing science and technology; workforce skills assessment and certification; and technical assistance to smaller suppliers.

Founded in 1989, NACFAM has built a unique, public-private community of over 1,500 corporations, 20 national trade associations, and 350 non-profit organizations that offer productivity enhancing services to manufacturers: Federal labs and university research centers in the field of R&D; community and technical colleges in the field of workforce education and training; and manufacturing extension services in the field of supply chain optimization.

FOREWARD

As the impact of technological change and economic globalization on the American workforce has accelerated, the need for highly skilled workers has become the subject of a growing body of research and expert commentary in recent years. The following report assembles some of this material, published mostly in the 2000-2003 timeframe. These sources include major studies by leading organizations; statistical reports by the federal government; and selected views of prominent authorities.

This report organizes these materials within three broad categories: importance of the workforce skills issue; nature of the current skills gap; and examples of responses to this issue within the public and private sectors. Within each of these categories, the report draws inferences from the findings to reach conclusions about the current state of workforce skills and future challenges. Those conclusions are encapsulated in an "Executive Summary" at the beginning of the paper. While skill shortages in the technology-intensive manufacturing sector are often cited as an example, this paper is focused primarily on skills issues in the economy as a whole.

This paper comments on federal and state programs, but does not contain specific public policy recommendations. NACFAM is planning to release updated policy recommendations in June, 2003.

NACFAM would like to thank especially the following individuals for reviewing this report: Jan Bray, Association for Career and Technical Education; Charles Carter, Association for Manufacturing Technology; Matt Coffey, National Tooling and Machining Association; Kimberly Green, National Association of State Directors for Vocational-Technical Education Consortium; Daniel Hecker, Bureau of Labor Statistics, U.S. Department of Labor; Richard Hinckley, National Coalition of Advanced Technical Centers; Harry Moser, Charmilles Technologies; John Rauschenberger, Ford Motor Company; Mark Troppe, National Center for Education in the Economy; Ken Voytek, National Institute of Standards and Technology, Manufacturing Extension Partnership; Richard Walker, National Tooling and Machining Association; and Joan Wills, Institute for Educational Learning.

While an effort was made to integrate these reviewers' comments, this report does not necessarily reflect their views. NACFAM alone is responsible for this report and its conclusions. The principal researcher was Leo Reddy, CEO and Founder, who has worked on various workforce development policies and programs within NACFAM since 1992. Special thanks is offered here to Fred Wentzel, NACFAM Senior Advisor for Industry Relations, who worked with reviewers and helped to validate several of the key findings in the paper, and to members of the NACFAM research staff, Paul Grambsch, David Jones, and Terry Jones for their contributions of materials and final edits.

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The Case for Enhancing American Workforce Skills: Summary and Analysis of Recent Research Findings and Authoritative Commentary

EXECUTIVE SUMMARY

The continued global economic competitiveness of the United States depends in large part on closing the wide gap between the knowledge and skills needed in today's technology-based workplace and the current low level of preparedness of this country's workforce. This NACFAM report documents and examines this *skills gap* issue facing the United States. This research supports the case for moving this issue to a much higher place on the national agenda.

The enhancement of workforce skills and knowledge would help the nation sustain higher levels of productivity growth and innovation:

While technology-based productivity growth is maintaining current U.S. economic strength, the development of a highly skilled workforce, more capable of keeping pace with technological change, has the potential to achieve and sustain even higher rates of productivity growth. According to the Council on Competitiveness:*

> "A well-educated and technically-trained workforce…enables a country to shift more of its economic activity into higher technology and more productive activities that support higher wages."

Although the U.S. continues to lead the world in labor productivity, competition is growing from both developed and developing economies. Since the U.S. can not compete on labor costs, it must have a workforce with the skills needed to deal with higher levels of innovation and technical complexity.

Yet the skills gap is deepening:

Surveys continue to indicate that the shortage of skilled workers is limiting sales, inhibiting productivity improvements and posing a major barrier to growth. For example, the Manufacturing Institute reports that 80% of manufacturing executives are experiencing a shortage of qualified workers, with 68% stating that this shortage negatively impacts their ability to maintain production levels.

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* Full citations of sources are contained in the main body of this paper

If current trends prevail, this shortage will become even deeper in the future. Nearly 60% of the new jobs in the early 21st century will require skills that are held by just 20% of the present workforce.

Responses at all levels are insufficient:

A 2002 report by the U.S. Department of Education concluded, "After 85 years of federal support for vocational education, America's young people still need the skills to succeed in a changing world of work." While the logical implication from this conclusion is that more effective technical education programs are needed, the government is instead shifting its focus almost exclusively towards academic requirements.

The U.S. Department of Education now plans to transfer its traditional Perkins Act funding for vocational and technical education primarily towards more rigorous academic programs in high school. This places the burden of high-quality technical education on community colleges without providing them with additional resources—at a time when state government funding is rapidly declining.

Federal support has also waned for building a national system of industry-led skill standards, assessments and certification--a promising process for building tighter linkages between school and work and creating a larger pool of workers with the skills and knowledge required for technology-based growth and innovation.

Employers are increasingly seeking both degrees and skills certifications, but major certification gaps remain:

Employers want stronger guarantees that workers have both academic and technical skills and knowledge. According to Matt Coffey, President of the National Tooling and Machining Association, the name of the game for employers and individuals these days is skills with degree credit; skills certifications should also be linked to credits to be credible for parents and students.

Certifications are becoming widespread in the software industry, but are uneven in other sectors where employers are not yet providing full support. For example, certifications for manufacturing production workers remain very limited: Of the 112 occupational categories listed by the Bureau of Labor Statistics, covering some 11 million production workers, only a handful receive certifications.

Conclusion*:* This report concludes that both government and industry need to undertake a sustained, focused effort to substantially and permanently improve the existing structures of workforce education and training. This report also raises important questions requiring further research to assess the full dimensions of this problem and to define measurable policy improvements.

NACFAM hopes that this report will not only help to frame the *skills gap* debate, but will also provide the kind of understanding and thoughtful analysis that can result in more effective solutions.

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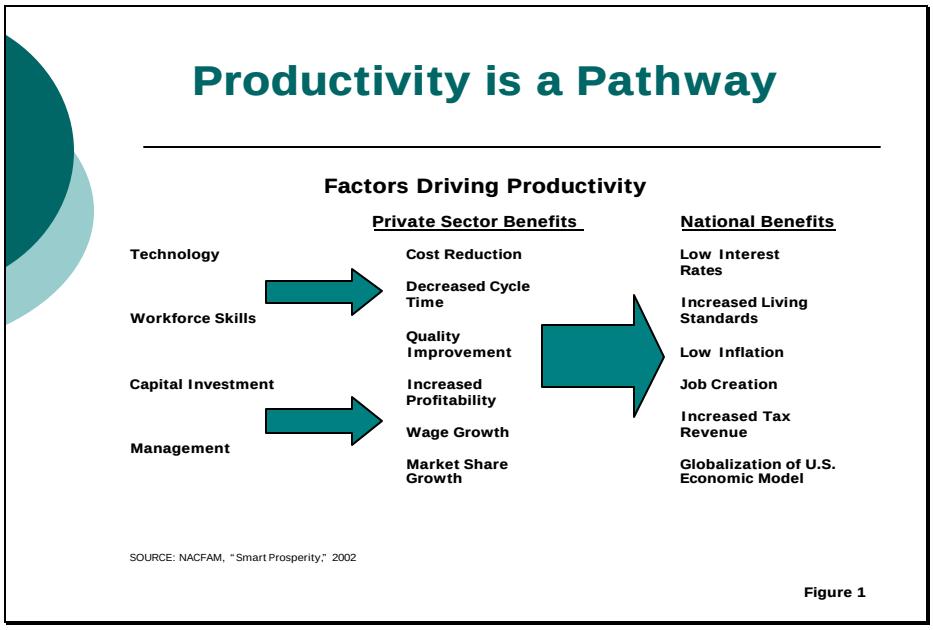
I. LINKAGE OF PRODUCTIVITY AND WORKFORCE SKILLS AND KNOWLEDGE: IMPORTANCE OF THE ISSUE

"America's economic future depends upon the strengths of our workforce." National Governors Association, *A Governor's Guide to Creating a 21st Century Workforce,* 2002, Washington DC

PRODUCTIVITY – Workforce Skills and Knowledge: A key to achieving unprecedented levels of productivity growth and innovation.

A highly skilled workforce, capable of keeping pace with technological change, has the potential to take the lead in driving productivity growth

Workforce skills are a major driver of productivity – the pathway to benefits for both the private and public sectors. **(Figure 1)**



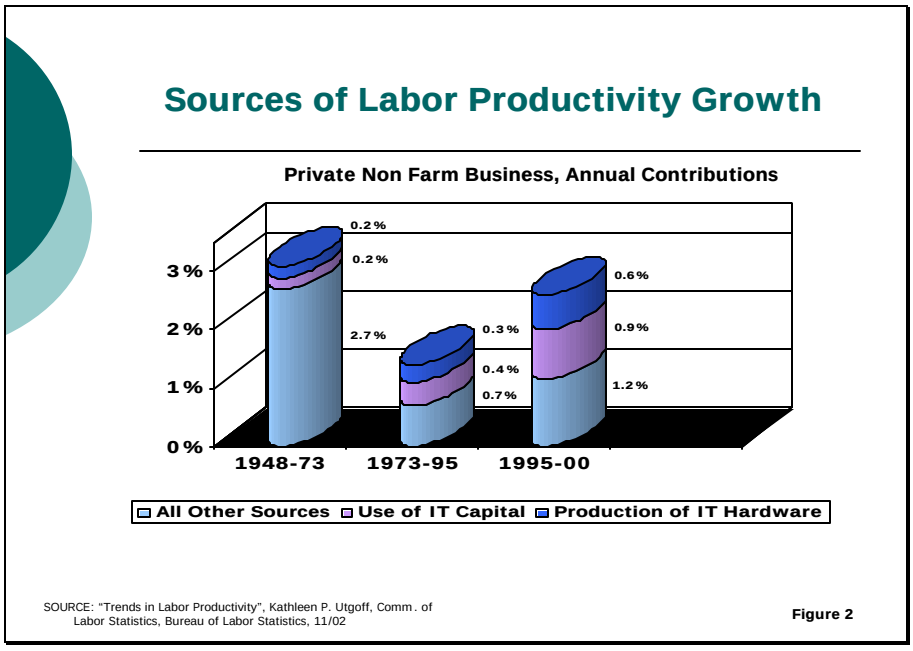
Looked at another way, the most important economic measure of the contribution of workforce skills and knowledge is the impact on productivity growth. "The goods and services produced from each hour of work is the magic elixir of economic progress." (David Wessel, "the Magic Elixir of Productivity," *Wall Street Journal,* February 15, 2001)

The Centre for Economic Policy Research adds the following perspective: "Productivity growth, innovation and product quality all rest critically in the hands of skilled employees and will suffer in their absence…A highly skilled workforce,

capable of keeping pace with technological change, has the potential to take the lead in driving productivity growth."[1]

Despite this potential, many leading economists would assert that information and communications technology (ICT) – more than enhancements in workforce education and training – is now the principal driver of U.S. productivity growth, **(Figure 2)** Federal Reserve Board Chairman Greenspan, a well-known proponent of this view, contrasted the role of technology with other factors, include worker quality, in a speech last fall:

> "With capital spending sluggish over the past year, and *no evident acceleration of worker quality [emphasis added]*…the pickup in productivity growth since 1995 largely reflects the ongoing incorporation of innovations in computing and communications."[2]



Yet, this conclusion is not inevitable. In a 1996 study, researchers Sandra Black and Lisa Lynch concluded that investment in workforce education and training has twice the impact on productivity growth as does investment in technology.[3]

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[1] "The Skills Gap," June 2001, London

[2] Remarks by Alan Greenspan, Chairman, Federal Reserve Board, "Productivity," at the U.S. Department of Labor, October 23, 2002, Washington DC

[3] Sandra Black and Lisa Lynch, *How to Compete: The Impact of Workplace Practices and Information Technology on Productivity,* Wharton, University of Pennsylvania, 1996

These findings suggest strongly that if the accelerated investment in technology is matched by an equivalent acceleration of investment in workforce skills, the potential for achieving and sustaining even higher rates of productivity growth

could be realized. Are industry and government prepared to make that investment?

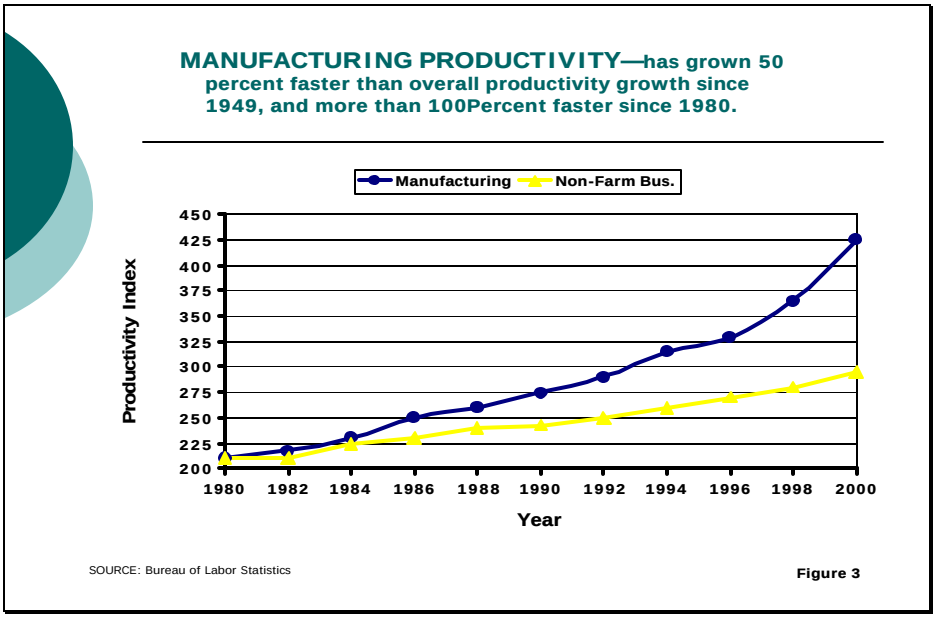
What makes this such a fundamental question is the importance of productivity to the Nation's future economic growth and strength – and the relative role that such underlying factors as technological innovation and high quality workforce skills have for productivity.

As stated succinctly by Michael Porter, "Productivity…determines the prosperity of any state or nation."[4] This was further underlined in a recent *Business Week* article, which stated, "Strong productivity gains create a positive fundamental for any economy. Higher efficiency can lift both profits and worker's incomes, and it keeps inflation low and borrowing costs affordable."[5]

Currently, productivity growth is serving as the cement that is holding the economy together, despite the decline in technology industries, the stock market, and the global economy in the past few years. In recent testimony, Alan Greenspan credited continuing high US productivity with maintaining U.S. economic growth throughout this economic slowdown.[6]

Indeed, according to year-end estimates by the Bureau of Labor Statistics, overall productivity growth rose 4.5% in 2002—the largest rise since 1950—with durable goods manufacturing contributing 5.7%. This performance by the manufacturing sector is consistent with historical trends, which show this technology-intensive sector growing 50% faster than overall productivity growth since 1980. **(Figure 3)**

[4] Michael E. Porter, *Harvard Business Review, 1999*
[5] James C. Cooper and Kathleen Madigan, "Productivity Gains: The Good News and the Good News," *Business Week,* November 22, 20
[6] Testimony before Senate Commerce Committee, February 11, 2003



What makes these figures so topical today is that non-inflationary productivity growth is a pathway to generating the revenues needed to meet national domestic and military needs without deepening the federal deficit. In a speech on October 23, 2002, the Commissioner of Labor statistics noted the connection between productivity and revenue: "If productivity is up 1% per year, the cumulative deficit will go down by $2 trillion over 10 years."[7]

Among our pressing domestic needs is the requirement that younger workers be more productive to support a growing number of retirees. The Economic Policy Institute (EPI) has pointed to the intimate connection between workforce education, technology and the country's ability to support its growing retired population. In EPI's view, "Future living standards and society's ability to support the elderly depends primarily on the productivity of workers. Productivity rises when workers are well educated, use the best, most advanced equipment, and are supported by a sound economic infrastructure."[8]

GLOBAL COMPETITIVENESS – A skilled workforce: central to America's continued leadership in the global economy

U.S. continues to lead in labor productivity

The US led 10 of the largest industrial countries in manufacturing labor productivity in 2000. The U.S. labor productivity growth rate of 7.1% was followed by Germany (6%), France (5.8%), Japan (5.4%), UK (5%), Sweden (4.8%), Belgium (3%), Canada (1.2%), and Norway (1.1%).[9]

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[7] Speech at American Enterprise Institute by Kathleen Utgoff, Commissioner of Labor Statistics, U.S. Department of Labor, October 22, 2002, based upon OMB FY2003 Budget projections.
[8] "America's Golden Years: Ensuring Prosperity in an Aging Society," *Issue Brief,* April 3, 1998
[9] U.S. Department of Labor, Bureau of Labor Statistics, *International Comparisons,* 2000.

But competition in the global labor market is intensifying.

This is not a cause for complacency. Competition is growing from both industrialized and developing countries.

Industry will invest in technologically-advanced countries with a highly skilled-high wage workforce, if they believe they can receive a higher return on their investment. Indeed, the vast majority of the estimated cumulative stock of foreign direct investment is headed into developing nations, including "an astounding 87 percent of U.S. foreign direct investment in 2000, compared with 80 percent in 1998."[10]

Former GM CEO Jack Smith has also underlined the structural advantages that some European countries enjoy:

> "Thanks to their apprenticeship system, there is much more respect in Europe for technical careers than there is here in the US. More important, there is a clear link between education and employment. There is a partnership among business, government and labor to make sure that young people have the skills they need for a good-paying job."[11]

Developing countries in general continue to enjoy such advantages as low labor costs, but the challenge from China is becoming especially acute. As the nation with the largest population on earth (over 1.5 billion), China has an enormous pool of low-wage, but *skilled* workers and engineers, many working in state-of-the-art facilities.

Moreover, in a break from their long-standing practice, American, European, and other Asian automobile manufacturers and suppliers are starting to use factories in the developing world to supply their major markets in the United States, Japan and Europe. According to the *Wall Street Journal,* this represents, "a basic shift that could have big ripples around the world, creating new industrial bases in Third World countries and threatening the jobs of workers in the higher-cost factories of North America, Japan and Western Europe."[12]

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[10] Deloitte Research, "Global Investment Trends of U.S. Manufacturers, 2001

[11] Remarks at annual Meeting of the National Alliance of Business, October 31, 2000, Washington DC

[12] From "A Global Journal Report," *Wall Street Journal,* July 31, 2002

Looking ahead, U.S. prosperity in today's knowledge-driven economy will demand the world's most skilled and productive workforce. The members of the Council on Competitiveness have singled out worker skills as the greatest competitive challenge the nation faces over the next decade. Their concern reflects a broad recognition among leaders from business, labor, and universities that "global competition has intensified, increasing the economic premium on high skills and leaving unskilled American workers in an increasingly vulnerable position."[13]

Awareness of this issue is growing

From the business perspective, the commodization of products and shipping production offshore has caused U.S.-based businesses that wish to remain competitive to make a strategic shift towards more complex and innovative product work processes in the U.S. This, in turn requires higher technical skill levels to stay in business.[14]

The business-led Council on Competitiveness echoes this view:

> "A well educated and technically-trained workforce is essential to a nation's competitiveness in two key ways. First, it enables a country to shift more of its economic activity into higher technology and more productive activities that support higher wages. Second, an educated workforce is necessary to retain domestic investment and attract multinational investment."[15]

The Manufacturers Alliance for Productivity and Investment has published its view that the globalization of the U.S. economy and related technological innovations have forever changed the nature of employment for workers in the United States. They conclude that these changes in the industrial structure of the economy will increase the demand for a skilled workforce.[16]

The nation's governors are also increasing their focus on workforce skills. According to *A Governor's Guide to Creating a 21st Century Workforce*[17], "To help their clusters of innovation thrive and compete worldwide; governors will need to work with their educational institutions and the private sector to build a skilled labor force that is second to none."

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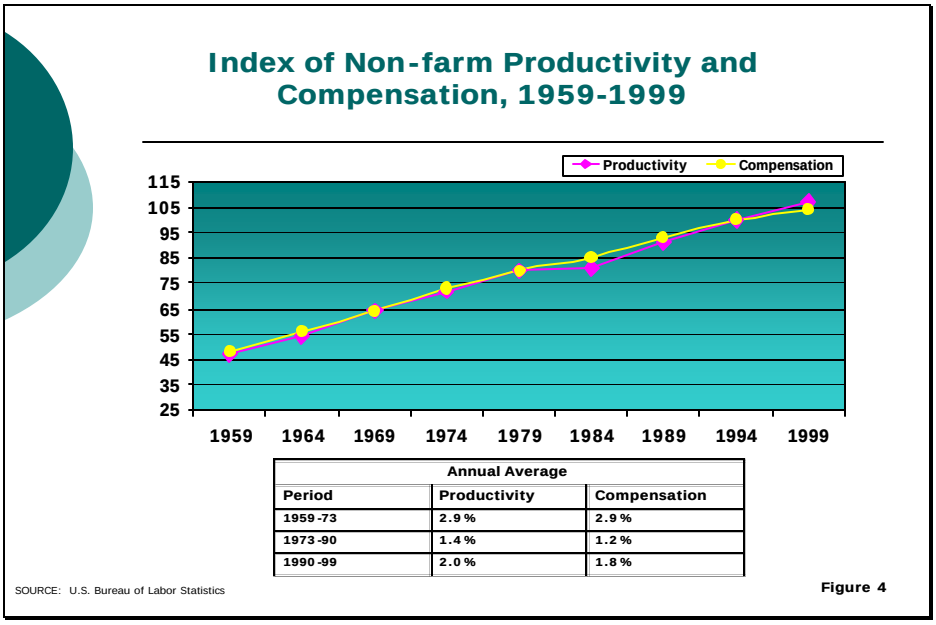
[13] Council on Competitiveness, *Winning the Skills Race,* May 1998, Washington DC
[14] From interview with Matt Coffey, President, National Tooling and Machining Association, January 2003
[15] Council on Competitiveness, U.S. Competitiveness 2001: Strengths, Vulnerabilities and Long-term Priorities, January 2001, Washington DC
[16] Manufacturers Alliance/MAPI, Globalization: Implications for U.S. Industry and the Workforce of the Future, 2000, Arlington VA
[17] National Governors Association, 2002, Washington DC

The National Governors Association has just conducted a year-long effort to develop economic strategies for a global marketplace. "These strategies are designed to provide lifelong learning and training for employers and employees, strengthen science and technology capacity, develop international markets, and bring prosperity to disadvantaged communities. This new approach to economic development is a major shift from the traditional approach—which chiefly relied on location-based tax incentives to attract large manufacturing entities—and represents a more effective strategy for competing in the global economy."[18]

JOBS AND WAGES – Higher Skills and Productivity Leading to Higher Wages

Productivity and compensation are directly related.

At least since the 1950's, worker productivity and worker compensation have been directly related: they rise and fall together. **(Figure 4)**



Annual Average		
Period	Productivity	Compensation
1959-73	2.9%	2.9%
1973-90	1.4%	1.2%
1990-99	2.0%	1.8%

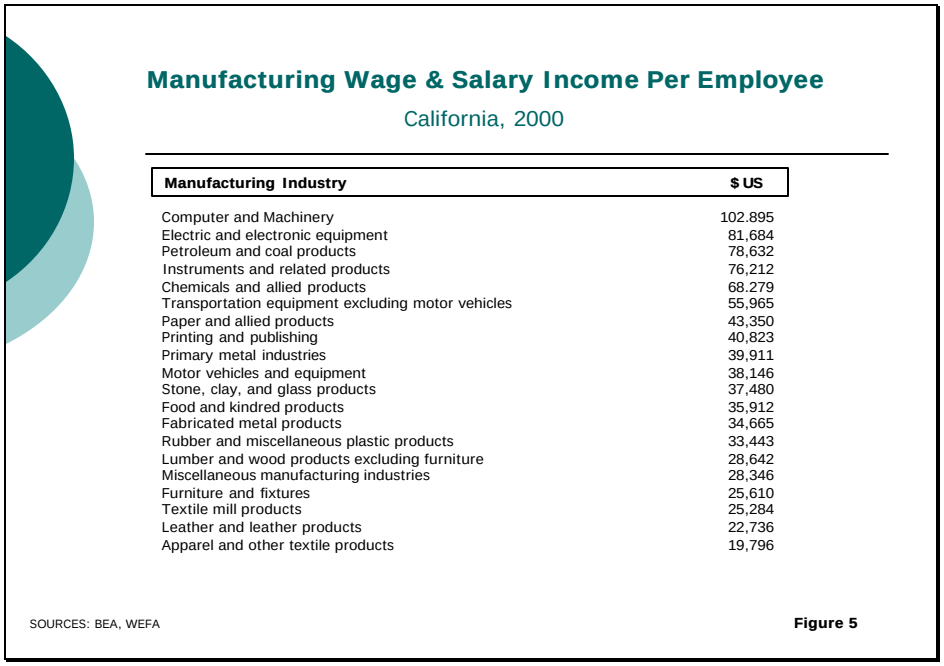
SOURCE: U.S. Bureau of Labor Statistics

Figure 4

Technology intensity and wage levels are also directly correlated

[18] Op. cit.

According to a recent study of the California workforce, “The annual salary per employee in low-tech industries such as apparel, lumber, and food and kindred products, is lower than the salaries paid in the high-tech manufacturing sector for two reasons: the labor involved in these industries is not high-skill intensive, and low-skilled manufacturing industries tend to locate in parts of the state where the cost of living is lower.”[19] **(Figure 5)**



Manufacturing Wage & Salary Income Per Employee

California, 2000

Manufacturing Industry	$ US
Computer and Machinery	102.895
Electric and electronic equipment	81,684
Petroleum and coal products	78,632
Instruments and related products	76,212
Chemicals and allied products	68.279
Transportation equipment excluding motor vehicles	55,965
Paper and allied products	43,350
Printing and publishing	40,823
Primary metal industries	39,911
Motor vehicles and equipment	38,146
Stone, clay, and glass products	37,480
Food and kindred products	35,912
Fabricated metal products	34,665
Rubber and miscellaneous plastic products	33,443
Lumber and wood products excluding furniture	28,642
Miscellaneous manufacturing industries	28,346
Furniture and fixtures	25,610
Textile mill products	25,284
Leather and leather products	22,736
Apparel and other textile products	19,796

SOURCES: BEA, WEFA

Figure 5

[19]Milken Institute, *Manufacturing Matters: California’s Performance and Prospects,* Milken Institute for California Manufacturers & Technology Association, August 2002, Santa Monica CA

In general, manufacturing, which is more technologically intensive than most other sectors of the economy, pays well. For example, manufacturing offers higher pay than construction, services, and retail trade.[20]

Overall manufacturing employment, however, is declining, with a loss of two million jobs since 1999. On the plus side, the U.S. Department of Labor currently predicts a cumulative 3% *increase* in manufacturing employment by 2010 from the 2000 base-year, as follows:

2000 – 18,469,000
2010 – 19,047,000

[20] U.S. Department of Commerce, Bureau of Economic Analysis, 1999

II. THE SKILLS GAP: THREAT TO INCREASING PRODUCTIVITY

"Today, the success of the American economy rests on the brainpower of its workforce…The mismatch between skill needs and skilled employees clouds our nation's economic future"--*Christopher B. Galvin, Chairman and CEO, Motorola*[21]

EXISTENCE OF THE SKILLS GAP – Surplus of Low-Skilled Workers; Scarcity of High-Skilled Workers

Business concerns over the skills gap now widespread and documented

During the past several decades, U.S. businesses increasingly have discussed among themselves the problem of finding sufficient numbers of skilled workers to meet production and quality control requirements, to operate more technologically advanced equipment, and to improve bottom-line productivity and competitiveness. This lack of sufficiently skilled workers has been particularly evident in key segments of American manufacturing, but nearly every other industry sector also has expressed concern over the lack of appropriately skilled workers.

Within the past several years, this business concern has come to emerge as an important topic for more systematic investigation and documentation.

For example, the Hudson Institute study, *Workforce 2000: Work and Workers for the 21st Century*, found that more than one-half of America's youth leave school without foundation entry-level skills necessary to find and hold a good job. This conclusion is supported by an earlier 1998 Price Waterhouse Coopers Survey that discovered that one in three CEOs of high growth firms reports deficiencies in the problem-solving skills of new hires. Respondents from 90% of Fortune 1000 companies claim that a lack of employee basic literacy and problem solving skills negatively affected productivity and profitability.

In a 2000 national survey conducted by the U.S. Census Bureau on the hiring, training, and management practices of American businesses:

- employers overall responded that 20% of their current workers were not fully proficient in their jobs
- 40% of respondent executives stated that they are unable to modernize operations because their employees do not possess the requisite skills

[21] Cited by National Skill Standards Board and Workforce Excellence Network in, *Using Skill Standards & Certifications in Workforce Investment Board Programs,* 2001, Washington DC

- Only one in five businesses considered at least 95% of their employees to be fully proficient.
- Employers expressed a general lack of confidence in the ability of schools and colleges to prepare young people for the workplace.

In 2001, a Gallup survey for the National Federation of Independent Business found that "the shortage of skilled, trained workers" was the number one problem of its members. More particularly, this survey found that 71 percent of firms employing fewer than 250 workers maintained that it was "hard" to "very hard" to find qualified workers. Similarly, a *Washington Post* survey of regional high-tech firms discovered that fewer than two in five job applicants had the appropriate skills required for employment.

Other documented examples of deepening business concerns regarding the Skills Gap include:

- A 1998 Coopers & Lybrand report determined that the number of CEOs who say that the lack of skilled workers is the number one barrier to growth increased from 32% in 1993 to 67% in 1997.

- A 1999 Select Appointments North America survey of 300 senior management executives reported that the shortage of skilled workers was limiting sales by as much as 33% and represented the single greatest challenge facing U.S. business.

- A 2001 Chamber of Commerce survey showed that 90% of its members identified the shortage of skilled workers as a top priority.

Among various industries that employ large numbers of people, the health care industry continues to report severe workforce skills shortages: In a 2002 study, the American Hospital Association found that "Hospitals today face both an immediate need for caregivers and support staff and an even more threatening long-term shortage of qualified workers:

- The U.S. labor force is growing
- There are fewer workers coming behind the aging "baby boomer" generation
- Careers in health care are seen as less attractive to those entering employment."[22]

<u>Concerns are especially deep – and well-documented – in manufacturing</u>

[22] American Hospital Association Commission on Workforce for Hospitals and Health Systems, *In Our Hands: How Hospital Workers Can Build a Thriving Workforce,* April 2002

U.S. manufacturers also have directly voiced their concerns regarding the Skill Gap issue. These concerns in manufacturing are both especially deep and well-documented.

The Skills Gap 2001, a major study by the National Association of Manufacturers, Center for Workforce Success, found that U.S. manufacturers "face a persistent skills gap in the workforce, despite an economic downturn and despite billions of dollars spent on education and training initiatives in the past decade. This gap derives from long-term forces – demographics, technology, and globalization – whose impact will be felt for years to come." Some specific findings include:

- Two-thirds of respondents said their most serious workforce shortages are among production workers and those directly supporting them—ranging from entry-level workers, operators, machinists, craft workers, to technicians and engineers;
- 8 of 10 manufacturers experience a shortage of qualified workers
- Two-thirds of respondents said the lack of skilled workers negatively impacts their ability to maintain production levels, and 40 percent said it makes it difficult to improve productivity;
- 78% of respondents believe public schools are failing to prepare students for the workplace; the biggest deficiency of public schools is not teaching basic academic and employability skills;
- 26% percent of manufacturers report that workers lack basic math skills
- More than 30% report that workers are deficient in basic comprehension and writing skills;
- 59% say employees lack work readiness skills such as arriving on time and staying at work all day;
- More companies are being forced to provide basic remedial education services to new employees
- Respondents ranked technical colleges, business associations and community colleges as their top source for outside training. This is the first time that business associations were ranked among the top sources for training and reflects their changing role in workforce development.

Manufacturers are also becoming increasingly aware of another Skills Gap issue: the steady decline in students majoring in manufacturing-related curricula. According to a National Center for Education Statistics report in 2001, the number of bachelor's degrees awarded from 1986 to 1998 decreased for business, engineering, mathematics, and computer science. However, the number of degrees in visual and performing arts, social sciences, protective services, psychology, and liberal arts increased.

Costs to business for remedial training and recruitment are high

In its 2002 report, *The Competitive Challenge: Building a World-Class Workforce,* the National Association of State Workforce Board Chairs (NASWBC)

recommends that action should be taken now to "increase the business community's satisfaction with education and training systems." This report further states that:

> "The annual budget of the U.S. elementary and secondary school (K-12) system is $372 billion, and the higher education annual budget is $247 billion. Despite these expenditures, almost one in four youth suffers from low literacy rates. U.S. employers spend $62 billion per year on basic
>
> skills training for their employees. Employers repeatedly say that their workers are under prepared for the jobs of the knowledge-based economy. 'Teach them to read, compute, problem solve and work in teams – we will teach them to make our widgets.'"

This NASWBC estimate updates an earlier 2000 projection by the U.S. Bureau of the Census that business and industry was spending over $50 billion annually to conduct technical training beyond that provided by community colleges and vocational schools.

The recruitment quest for workers with the right skills is also a costly undertaking. As reported by one industry expert, "A human resources manager at a manufacturing company reviews 100 applications to fill vacant positions. Only a few are worthy of consideration for an interview and, of those, probably only one or two applicants will get one…Companies are spending large sums of money looking for the right people."[23]

The Skills Gap problem is not going to solve itself

Current evidence further suggests that this Skill Gap problem is not about to automatically solve itself in the decades ahead.

For example, in *The Competitive Challenge: Building a World-Class Workforce,* the NASWBC noted that "between 1998 and 2008, our economy will generate 14.1 million new jobs that require advanced skills – acquired through at least some postsecondary education – and only 6.2 million new jobs that require a basic and minimal skill level – a skill level found among many school dropouts and high school graduates."

Estimates by education and labor economist, Anthony Carnevale, project that by 2020 the United States will lack at least twelve million people with some

[23] John Rauschenberger, Manager, Personnel Research and Development, Ford Motor Company, "Skills Gaps Threaten Future Economic Growth," *Advanced Manufacturing,* January 2002

postsecondary education who are needed to fill the jobs of the knowledge-based economy.

As cited by the National Association of State Workforce Board Chairs, U.S. Assistant Secretary of Commerce for Economic Development David Sampson "clearly and concisely articulated what is at stake" when he said in December 2001 that "unless the skills gap within the United States is closed and employers

can find the workers they need, and job seekers have the skills to pursue the opportunities that will exist, then America's economy will remain extremely vulnerable."

In a March 2003 report written for the National Skill Standards Board,[24] author Rick Spill includes a section that compiles some additional evidence about the current U.S. workforce Skills Gap from a wide range of recent studies and reports. In this section, Spill clearly summarizes why this issue matters for the Nation:

> "The continued global economic competitiveness of the United States depends in large part on closing the wide gap between the knowledge and skills needed in today's technology-based workplace and the current low level of preparedness of this country's workforce. America has a surplus of low-skilled workers and an alarming scarcity of high-skilled workers – a mismatch between the demand for skilled labor and the available supply."

THE LINK BETWEEN TECHNOLOGY AND THE DEMAND FOR SKILLED WORKERS – Continuing to expand as technological change accelerates and market pressures increase

The impact of technology is increasing exponentially

Although Chairman Greenspan and other economists correctly cite technology as the driver behind the "New Economy," they often fail to mention the direct linkage between technology and human skills. Without workers with the full skills and knowledge needed for implementation, companies will not get a full return on their investments in technology. As noted by INTEL Chairman Andy Grove:

> "Technology is created by—and for—people. To continue to develop and deploy technology, we will need ever-increasing numbers of well-

[24] National Skill Standards Board (Rick Spill, Author). Case for Nationally Recognized Skill Standards and Occupational Certifications: A Compilation of Arguments and Supporting Testimony. (Preliminary Report), March 15, 2003, Washington DC, Pp. 5-8.

> educated and capable employees. Simply put, the future of technology depends on the availability of human resources."[25]

These types of skills also lead to higher levels of creativity and innovation. As noted by *Business Week,* "In the 21st Century, corporations know that creativity is the sole source of growth and wealth. The value of education rises exponentially in a technology-driven economy based upon ideas and analytic thinking."[26]

Another major impact of technology is its use in preparing the workforce through distance learning, "e-learning," and on-line instruction. One champion of this view is U.S. Commerce Secretary Donald Evans: "Successful development and deployment of [advanced technologies] in education and training could have a

profound effect on American competitiveness and our standard of living. A world-class workforce is vital to the nation's ability to compete."[27] Indeed, advanced learning technologies and processes may contain the ultimate solution to the skills gap.

Looking ahead 20 years, the National Research Council predicts: "Individuals and teams will learn new skills rapidly because of advanced network-based learning, computer-based communications across extended enterprises, enhanced communications between people and machines, and improvements in the transaction and alliance infrastructure."[28]

Advanced education and training will be required

One consequence of the pressures of technology and the market is a quantum leap in the number of jobs that will require postsecondary education. According to the Bureau of Labor Statistics:[29]

- Total workforce will rise to 160 million by 2008, creating 20 million new jobs
- 70% of the 30 fastest growing jobs will require an education beyond the high school level
- 40% of all new jobs will require at least an associate's degree

Stated another way, the National Commission on Mathematics and Science Teaching for the 21st Century reports that nearly 60% of the new jobs in the early 21st century will require skills that are held by just 20% of the present workforce.[30]

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[25] Cited by the Manufacturing Institute, in Education and Training: Manufacturers' Competitive Advantage, 1999, Washington DC

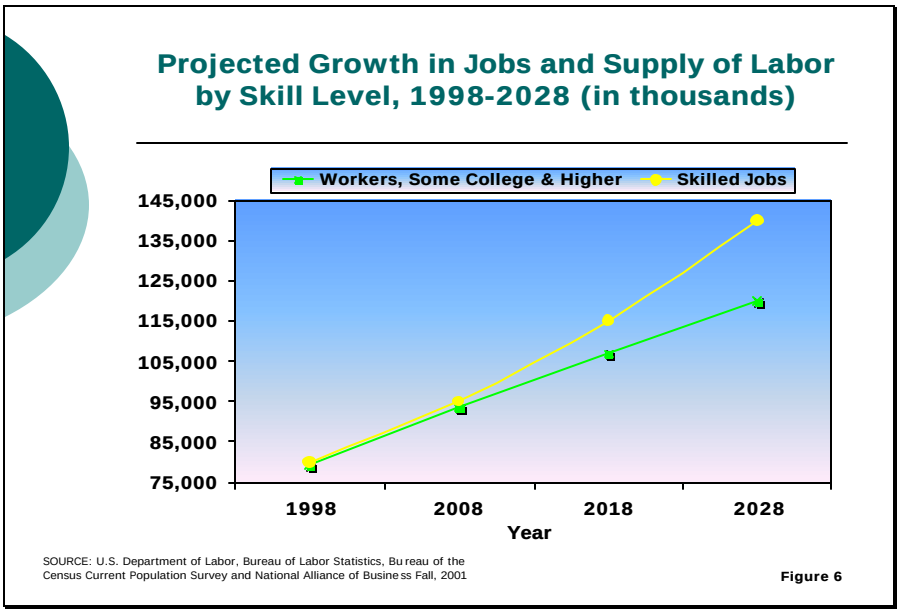
[26] "The 21st Century Corporation," Editorial, *Business Week,* August 28, 2000

[27] Quoted in 2020 Visions: Transforming Education and Training Through Advanced Technologies, September 2002, Washington DC

[28] National Research Council, Committee on Visionary Manufacturing Challenges, *Visionary Manufacturing Challenges for 2020,* National Academy Press, 1998, Washington DC

[29] *Occupational Employment Projections to 2008,* Spring 2000, Washington DC

By 2028, current projections indicate that the growth in skilled jobs (about 140,000,000) will be 15% greater than the supply of workers with some college (about 120,000,000). **(Figure 6)**



Moreover, occupations requiring a postsecondary vocational award or an academic degree, which accounted for 29 percent of all jobs in 2000, will account

for 42 percent of total job growth from 2000 to 2010.[31] According to the U.S. Department of Education's *National Assessment of Vocational Education: Interim Report to Congress* (2002), "Employment growth in occupations requiring a vocational associate's degree is projected to be higher (30 percent) than

[30] *Before It's Too Late: A Report to the Nation,* 2000
[31] U.S. Department of Labor, Bureau of Labor Statistics, "Occupational Employment Projections to 2010," *Monthly Labor Review,* November 2001, Washington DC

overall employment growth (14%) through 2008. Thus, demand for postsecondary vocational education is likely to remain strong."

The demand for IT skills will continue to grow strongly

By 2006, nearly half of all US workers will be employed in industries that produce or intensively use information technology products and services.[32] This will further drive workers towards obtaining postsecondary education. Two-thirds of all workers in core IT occupations hold a bachelor's degree or higher, 26 percent have less than a four-year degree, and six percent have a high school diploma or less.[33]

In its study, *Securing America's Industrial Strength,* the National Research Council concludes:

> An adequate, well-trained workforce—particularly those skilled in creating, developing and deploying information technologies—will be required to ensure that the United States remains prosperous and a locus of innovation.[34]

To illustrate the profound impact of technology on the workplace, note the following changes in the duties of a draftsman, as described by the U.S. Department of Labor:[35]

1966-67 Duties	**1998-99 Duties**
Use instruments such as compasses, dividers, protractors, and triangles	Use computers, calculators, computer-aided drafting (CAD)

New kinds of skill requirements are emerging rapidly

Technology is also changing the nature of "skills." A definitive example are the industry-led skill standards developed by the Manufacturing Skill Standards Council (MSSC) under the terms of the National Skill Standards Act of 1994 and endorsed by the National Skill Standards Board in May 2001.[36] Created by some 4000 front-line workers and 350 subject matter experts, these standards define the functional skills and knowledge required within high-performance, technology-intensive workplaces. These standards put a premium on broad skills required by advanced technologies and processes, such as:

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[32]U.S. Department of Commerce, Economics and Statistics Administration, *The Emerging Digital Economy II,* June 1999

[33] U.S Department of Commerce, Office of Technology Policy, *The Digital Workforce: Building Infotech Skills at the Speed of Innovation,* June 1999, Washington DC

[34] National Research Council, Board on Science, Technology and Economic Policy, National Academy Press, 1999, Washington DC

[35]U.S. Department of Labor, *Report on the American Workforce,* 1999, Washington D.C.

[36] These standards contained in *Blueprint for Manufacturing Excellence,* MSSC, Washington DC

- using information and communications technology
- gathering and analyzing information
- analyzing and solving problems
- organizing and planning
- working in teams
- making decisions and judgments.

The report of the 21st Century Workforce noted similar trends: "Our findings indicate that technical skills must be combined with … 'employability skills'—written and oral communications strength, project management, problem solving and analytical skills."[37]

In its predictions, the National Research Council foresees a workforce that will be "as diverse as the global economy. Interpersonal skills will be highly developed, cross-cultural barriers will be greatly reduced, and remaining differences will be

valued for their contributions to innovation."[38] The Council believes that five principal factors will compel the integration of human and technical resources:

1. To meet market demands, all members of the workforce will have to react quickly to customers, who will have high expectations and many choices
2. The rapid response environment will require effective communications at all levels of an organization, especially with customers, suppliers, and partners.
3. The rapid assimilation of new technologies will require rapid learning throughout the enterprise.
4. Frequent reconfigurations will require that enterprises adopt a systems approach
5. Successful enterprises will require that workers be self-motivated and have a sense of ownership.

[37] 21st Century Workforce Commission, *A Nation of Opportunity: Building America's 21st Century Workforce,* June 2000, Washington DC

[38] National Research Council, Committee on Visionary Manufacturing Challenges, *Visionary Manufacturing Challenges for 2020,* National Academy Press, 1998, Washington DC

III. RESPONSES AT ALL LEVELS—FEDERAL AND STATE—ARE INSUFFICIENT

"Globalization and the Net will allow corporations to seek out the best educated and trained around the world… Despite all the lip service to education, politicians and governments do not comprehend the need for massive changes in schools." "The 21st Century Corporation," Editorial, *Business Week,* August 28, 2000

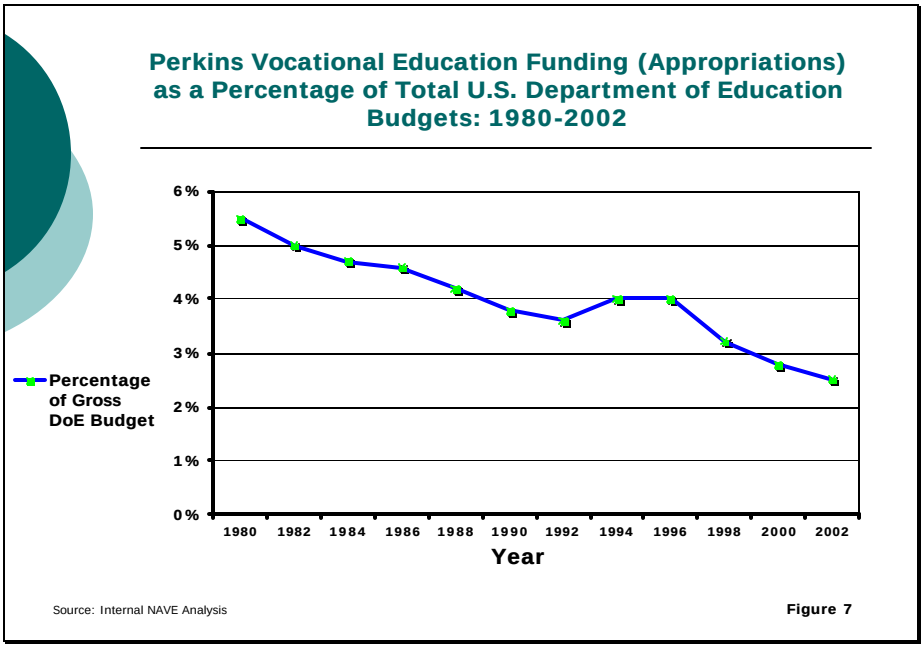
FEDERAL POLICIES AND PROGRAMS – Focused more on academic preparation

Historic trends point to declining resources for vocational-technical education

Vocational Education has occupied a significant place in American education since the first federal legislation was enacted in 1917 [Smith-Hughes Act] to help ensure that our nation's young people had the skills necessary to succeed in a changing world of work. However, the U.S. Department of Education's 2002 *National Assessment of Vocational Education* offers a weak report card on this long-term effort:

> "Eighty-five years later, after 13 legislative reviews and revisions and far-reaching economic, social and technological changes, one thing remains constant: America's young people still need the skills to succeed in a changing world of work, although the mix of skills is constantly evolving."

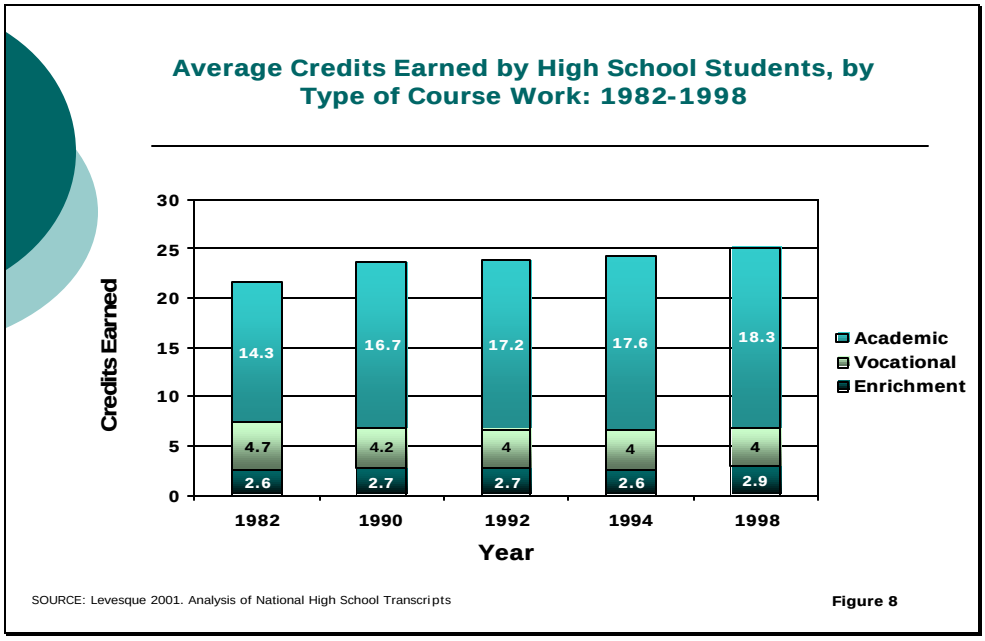
This situation could be exacerbated by the steady reduction in federal resources. The Carl D. Perkins Vocational and Technical Education Act, the successor to the Smith-Hughes Act, is due for reauthorization in 2003. For the past 20 years Perkins has represented a declining share of federal education budgets. **(Figure 7)**



Resources for academic education are increasing

Funding for Title I of the recently enacted No Child Left Behind Act, which focuses on academic testing, is 10 times greater than funding for the Perkins Act.[39] Because of the increased emphasis on academic achievement, the percentage of time that high school students spend on vocational course work is steadily declining. **(Figure 8)**

[39] U.S. Department of Education, Office of the Under Secretary, *National Assessment of Vocational Education: An Interim Report to Congress,* 2002, Washington DC



The trend towards greater federal support for academic preparation will be furthered by the current Administration's planned elimination of the Perkins program in favor of a transfer of technical education from secondary to postsecondary schools. Under the Administration's FY04 budget request, a proposed new "Secondary and Technical Education Excellence Act of 2003" would:

> ***"shift from providing traditional vocational education to an entirely new focus on supporting academic achievement at the high school level and on providing high-quality technical education at the community college level that is coordinated with local high schools."[40]***

[40] U.S. Department of Education, Office of Vocational and Adult Education, *The Secondary and Technical Education Excellence Act of 2003: Fact Sheet,* February 3, 2003, Washington DC

The $1 billion in start-up new funding will be provided through block grants to the states, so the allocation of these funds between secondary and postsecondary education is not yet fixed. Nonetheless, these funds are approximately $300 million less than provided under the Perkins program, and a good portion must be directed towards academic testing and accountability programs at the secondary level. In other words, while this new program would shift the burden of technical education almost entirely to the postsecondary schools, it appears likely that community colleges will receive less funding for this enhanced responsibility than they would under Perkins.

This is at a time when community colleges are educating not only high school graduates, but a growing number of incumbent workers as well as individuals with BA degrees returning to college for technical skills. The U.S. Department of Education recognizes the latter challenge:

> "Many jobs require technical skills, as well as strong academic skills, that can be learned in secondary and postsecondary vocational courses but do not require a bachelor's degree. That is one reason why many Americans with bachelor's degrees are also turning to career and technical courses in community colleges."[41]

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[41] ***U.S. Department of Education*, National Assessment of Vocational Education: An Interim Report to Congress, 2002, *Washington DC***

At the secondary level, one also needs to ask whether it is practicable to remove most, or all, technical training, which is deeply ingrained. For example, according to a 1998 survey of School-to-Work Partnerships, 14.6% of secondary schools offered students some vocational program certificates denoting mastery of skills identified by industry groups at the partnership, regional, state or national levels.

Another potential drawback to the proposed Secondary and Technical Excellence Act is that it appears to perpetuate the division between "academic" and "technical" education. As the previous quote suggests, the Department of Education itself recognizes that jobs increasingly require *both* academic and technical skills. The separation of "academic" instruction may also tend to postpone contextual learning, despite its proven value. According to BLS findings:

> "Students who participate in contextual learning experiences based on academic standards are more likely than other students to take honors courses in math, science, lab science and advanced computer science."[42]

As Matt Coffey has observed, "Technical education has too long been at odds with mainstream academics. It is not one or the other; it is now both. In the future, advanced education and training will be required with academic credit to attract parents and bright students."[43]

The foregoing trends suggest that it is time to move beyond the traditional tensions between "academic" vs. "vocational," and "college-bound" vs. "career-bound" education. Most students are interested in productive careers, want and need to go to college, and learn better in a contextual framework. The time is at hand to look for more creative ways to integrate academic with technical education rather than perpetuating their separation.

Earlier federal support for a national skill standards and certification system has waned

The National Skills Standards Act of 1994 was an effort to build a stronger bridge between the needs of the employer community and the education and training community, contributing to the world of contextual learning. A voluntary national system of industry-led skill standards, assessments, and certifications would provide clear guidance to education, and would offer individuals an opportunity to attain nationally portable credentials.

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[42] U.S. Department of Labor, Bureau of Labor Statistics, *Initial Tabulations: 1997 National Longitudinal Survey for Youth,* 2000, Washington DC

[43] Interview with Matthew Coffey, President, National Tooling and Machining Association, January, 2003

These goals were reiterated in the *Skills Summit 2000 Recommendations* for building workforce skills and encouraging lifelong learning:

- Deliver education, training, and learning that are tied to high standards, lead to useful credentials, and meet labor market needs
- Incorporate skills of a high-performance workplace into workforce development curricula

- Promote a skills-based, portable documentation process that allows individuals to maintain a record of acquired skills and gives employers a concrete way to measure qualifications.
- Support the use of industry-endorsed, skill-based certifications now being completed by the National Skill Standards Board, and support nationally-validated industry standards that include academic, workplace readiness, and occupationally-specific standards in the design and implementation of all workforce development initiatives

The Department of Education recently reported on this promising initiative:

> "For nearly a decade, efforts to develop national skill standards and portable credentials for many occupations have received federal, industry, and labor support. These standards were intended to identify the skills required in particular fields and provide a focus for efforts to update vocational curricula. Employers were expected to value the certificates that students earned in the upgraded vocational programs."

At the time of this report, however, unrealistic expectations around both the time it takes to develop a broad system and the financial resources necessary have apparently diminished federal support for what may be the greatest hope for upgrading the skills of the workforce to meet the requirements of the economy today and into the future. The Administration did not request funding for the National Skill Standards Board in either its FY03 or FY04 budgets.

While this country debates the issue, numerous other countries have taken the development of national skills credentials to new levels. They have dedicated the needed time for invention and re-invention of their systems, and are providing more adequate financial resources to accomplish the task. (Specific examples include Australia, Germany and Great Britain.)

STATE AND LOCAL PROGRAMS – A promising venue for skills development, but with funding challenges

Governors recognize their "immense stake" in workforce development

State governors recognize their "immense stake—along with business and labor—in building the best workforce training and education system in the world."[44] This is fortunate, because state governments are the principal providers of funds for public education.

Public elementary and secondary schools are the primary educators of America's labor force. Public postsecondary institutions—colleges, community colleges, and universities—play key roles in teaching skills to new workers and working adults. Governors, in their 2002 *Guide to Creating a 21st Century Workforce* also recognize the need for successful workforce policies and programs that meet some of the 21st Century demands, including workforce system that reflect market needs and prepare individuals with the skills needed for the New Economy.

Governors are emphasizing the need for closer links between schools and employers. For example, the Council for a New Economy Workforce (CNEW), chaired by West Virginia Governor Bob Wise, developed a "single goal to encompass our workforce aspirations: Create a talent pool capable of meeting current market needs as well as the opportunities of the emerging, knowledge-based economy." His Council also calls for "seamless workforce systems that maximize client control over the outcomes. 'Clients' are the businesses that create jobs and the people who need education and training to work for a business or become an entrepreneur."[45]

Governors are also finding success in their strategy of trying to attract business investment to their states, not just with traditional tax breaks, but also with more robust workforce development programs. For example:

> "With the sweeping exit of textile jobs from the Southern economy, the most visible Southern recruitment successes of recent years have been automotive—Mercedes, Nissan, BMW, Hyundai. Every major auto industry recruitment effort has centered on workforce. Every winning state has made significant workforce training commitments to close deals."[46]

State governments also share an interest in skills-based assessment and certification—and accountability

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[44] National Governors Association, *A Governor's Guide to Creating a 21st Century Workforce,* 2002, Washington DC

[45] Cited by Southern Growth Policies Board in, The Mercedes and the Magnolia: Preparing the Southern Workforce for the Next Economy, 2002

[46] Southern Growth Policies Board, The Mercedes and the Magnolia: Preparing the Southern Workforce for the Next Economy, 2002

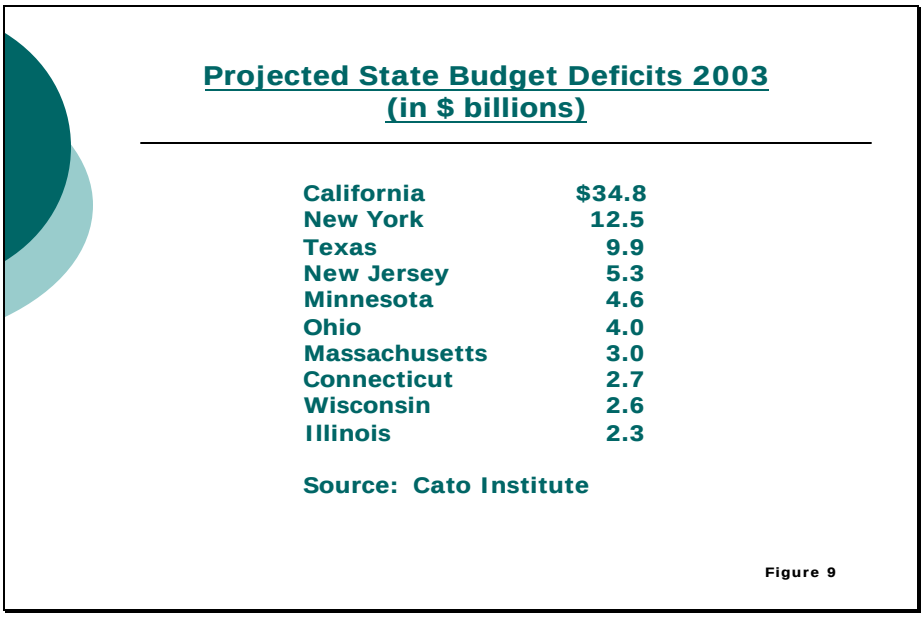
NGA Recommendations to Governors advocate the promotion of skill-based assessments and credentials and on meaningful outcomes—including income, skills levels, and job advancement.[47]

Many states are building workforce systems based around industry-led standards. Some of the most active states include Washington, Texas, Illinois, Indiana, and Louisiana. As one example, the Kentucky Manufacturing Skill Standards Consortium (KMSSC) is a statewide association of employers whose

goal is to develop and use common, industry-led skill standards and related assessment tools and curricula to create a skilled, entry-level manufacturing workforce. KMSSC is responsible for the ongoing work of keeping the skill standards updated.[48]

Yet state budgets are strapped

While the nation's governors appear to understand the fundamental importance of enhancing workforce skills and the value of building closer links between employers and educators, most states are severely strapped financially. **(Figure 9)** See below for some examples within more heavily industrialized states:



The plight of funds for technical education, even before this pervasive state budget crunch, is illustrated by the following report from a community development organization in Los Angeles about the shortage of resources for preparing skilled employees for the metalworking industries in the area:

[47] National Governors Association, *A Governor's Guide to Creating a 21st Century Workforce,* 2002, Washington DC

[48] Southern Growth Policies Board, *The Mercedes and the Magnolia: Preparing the Southern Workforce for the Next Economy,* 2002

"At a time when the metal manufacturing industry is experiencing a growing demand for skilled employees, Industrial and Technology Education in the State of California is in crisis. According to a Task Force convened by the State Superintendent of Public Instruction, 'programs have been steadily closed due to a number of factors. Almost no new teachers are preparing to enter the field, and programs that remain receive little support, in most cases, from the school administration or district. Currently, fewer than 25 percent of the programs in this field which were available to students in the mid-1970's are still viable.'"[49]

INDUSTRY PROGRAMS – Interest in skills certifications growing, but major certification gaps remain

Some businesses are increasingly looking for certificates

Employers have longed used academic degrees as a screening device. Increasingly, however, some business sectors are also seeking guarantees of workforce skills and knowledge. According to the National Center for Education Statistics, certificates increased 11% between 1996 and 1999 alone.

The primary impetus for the use of nationally recognized, industry-based skill standards and occupational certifications in this country is coming directly from business and industry. This is particularly the case with software certifications such as the Computer Technology Industry Association (CompTIA) A+, the high-tech Cisco Academies, Microsoft Computer Systems Engineer, and Novell certificates.

There are limited certifications in other sectors, including Automotive Service Excellence (National Automotive Technician Education Foundation); Certified Electronics Technician (Electronics Technicians Association); Entry Level, Advanced, and Expert Welders Certifications (American Welding Society); Machining Skills Level I Certification and Metal Forming Skills Level I Certification (National Institute for Metalworking Skills).

Yet certifications for production workers remain very limited

Of the 112 occupational categories listed by the Bureau of Labor Statistics under the heading, "Production Occupations," (representing some 11 million workers) only 2 categories ("welders, cutters" and "inspectors, testers" for etching and engraving) cite "postsecondary award" (i.e. programs, including apprenticeships,

[49]Community Development Technologies Center, Los Angeles Regional Workforce Preparation and Economic Development Collaborative, *Metal Manufacturing in Los Angeles County, Part V,* May 2000, Los Angeles

leading to a certificate or other award but not a degree) as the most significant source of postsecondary education and training.[50]

Training pays solid dividends to industry

One of the advantages of industry-led certification systems is that they provide a foundation for companies to benchmark their workforce against best practice. Companies can also use this benchmarking to assess skills gaps more precisely and to target their training. If done properly, workforce skills training can provide handsome dividends.

In this regard, a January 2002 "Industry Week Census" concluded that plants that provided less than 8 hours of training reported an average annual value of $139,000 per employee while those providing 21-40 hours reported $194,000. In addition, the federal government states that, Employers providing formal training for employees see 15-20% average increase in productivity. [51]

Community colleges and associations are playing a greater training role

Employers are increasingly outsourcing their training, especially to community and technical colleges. Total outsourced training expenditures for U.S companies rose from $9.9 billion in 1994 to $19.9 billion in 2000.[52] This expanded use of public sector organizations by industry is a positive trend by helping the nation to leverage its full national resources more efficiently.

According to Joyce Gioia, co-author of the recently released *Impending Crisis: Too Many Jobs; Too Few People,* the trend towards use of community colleges will accelerate as businesses begin to grasp the importance of career and technical education, especially in response to her prediction of a future acute shortage of workers. In her view,[53] innovative community colleges will be integral to this expansion, since many companies are already working with two-year colleges by catering certification courses to specific industry needs and offering on-site classes and employees as guest lecturers.

A newer development is the increasing role of business and trade associations in responding to their members' interests in closing the skills gap. According to the Manufacturing Institute:

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[50] U.S. Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data,* January 2002. (Note: BLS does not yet include the National Institute of Metalworking Skills (NIMS) certificates for machinists).
[51] U.S. Departments of Labor and Education, "21st Century Skills for 21st Century Jobs"
[52] *Training Magazine,* Spring 2001
[53] Interview reported in "Growth in Demand for Vocational Education Predicted," *Education Daily,* January 13, 2003

"Eight of ten associations said they were experiencing 'some' or 'a lot' of demand from their members for help in upgrading the skills of incumbent entry-level workers and for help in getting involved in school-to-career programs. Almost half said they were experiencing such demands for help in hiring, training and retaining hard-to-employ populations like the long-term unemployed, welfare recipients and inner-city youth."[54]

IV. MOVING FORWARD: WHAT'S TO BE DONE? WHO SHOULD DO IT?

Conclusions and Remaining Issues

This report has documented the case for a more vigorous effort by both the public and private sectors to enhance the skills of the American workforce.

As the research cited in this report has demonstrated, there is an important, direct linkage between productivity growth in the U.S. economy and the role played by high-skill workers. It has also found, however, that the supply of such workers is insufficient to meet business requirements and demands. Furthermore, this *skills gap* condition is not projected to significantly improve as the years progress, assuming the continuation of *status quo* workforce education and training policies, procedures, and practices.

Industry, State governments, and the Federal government are each involved in researching and developing (R&D) workforce education and training improvements to the *status quo.* Unfortunately, all too often these R&D involvements seem to be characterized by an "on-again", "off-again" pattern.

Industry itself does invest in improving workforce education and training. Of economic necessity, however, this improvement is usually limited to meeting the immediate or forthcoming production or service needs of a particular business or sector, rather than addressing broader regional, State, or national education and training requirements. In addition, during periods of economic downturn, industry businesses must often reduce or completely eliminate their R&D activities in order to conserve funds in order to survive.

[54] Manufacturing Institute, Center for Workforce Success, *Making the Connections: The Role of Employer Associations in Workforce Development,* 2000, Washington DC

The States also have proven to be effective laboratories for developing, testing, and implementing innovative improvements in workforce education and training practices, including those directly targeted at addressing State skills gap issues. One key limitation of these various State efforts, however, is that they too often stop at a State's borders, and thus may or may not adequately response to challenges and problems that are more broadly regional.

Moreover, State budgets, especially during times of economic recession, are often subject to significant, and sometimes severe, contractions or changes in direction. Most States have strict balanced budget requirements, and thus when their revenue falls, so must their expenditures. As a result, promising new workforce education and training activities again may not be sustained, or expanded, while at the same time the underlying business requirements for appropriately skilled labor may be both continuing and expanding.

The Federal Government does not face the absolute limits against deficit spending, as do most States. The Federal Government also has the advantage of being able to fund R&D activities with a national scope – including those in workforce education and training that can address the Skills Gap issue and contribute to enhanced national productivity.

Yet the Federal Government also faces numerous, ever-changing, and always competing broad-based "national priority issues" – in such areas as health care, social security, K-12 education, homeland security, or national defense. The result is that the Federal Government – both the Congress and the Executive Branch – often have difficulty in sustaining commitments to R&D efforts related to the development and promotion of new workforce education and training strategies—such as the development and promotion of a new voluntary national system of skill standards, assessment, and certifications that has been sponsored by the National Skill Standards Board.

Substantially and permanently improving the existing structures of workforce education and training in a nation as vast and varied as the United States has never been an easy task. Even with a validated, better approach to reducing the *Skills Gap* and thus contributing to increased U.S. economic productivity, permanently installing these improvements through the American education and training system takes years, if not decades, of sustained focus and effort.

While this effort is not easy, it is necessary if the United States is to continue to be the world's leader in the arena of global competition.

In an era of limited financial resources and competing priorities, the United States still must make room for addressing those issues – such as the workforce Skills

Gap – that represent the pathway to the nation's ability to sustain higher levels of productivity growth and increase the revenues needed to meet critical needs both at home and abroad.

Outstanding Research Questions

As this report indicates, there is a substantial body of research and authoritative commentary on the nature and linkage of the U.S. productivity and Skills Gap issues. In reviewing this material, however, it is equally clear that there remain some sufficient gaps in our knowledge about these issues and their exact relationship. To provide a fact-based foundation for increased public and private investment in this arena, better answers are needed to a number of questions. Some examples of such questions follow:

How can we more accurately measure the "skills gap"? Is there a baseline (e.g., a period in which the US did not have a significant skills gap) and metrics that can be plotted to provide more accurate trend data? How can we measure the success or shortcomings of various policies unless we have better measures?

Although workforce skills must be major component of productivity, can we obtain more accurate data on that relationship? Specifically, how does labor, education and training compare with other factors contributing to productivity, such as technology, management, capital investment, innovation? (The most recent studies, sponsored by Bureau of Census, are 7-8 years old.)

What are employer views on the sharpening debate between the "academic" and "career & technical" education perspectives? Do employers agree with the Administration's approach that K-12 should be focused principally on academic preparation (i.e. math, English, science) and that 2- to 4-year colleges and technical institutes should take care of technical education? Related questions:

- Do those 2- and 4-year colleges and technical institutes have the resources to meet this challenge?
- In 10 years, will employers hire anyone without at least a two-year degree or an industry-led certification?
- What is the strength of the infrastructure for preparing individuals for success in careers that require strong scientific and technical skills?

To what degree is business committed to hiring individuals who are certified against nationally recognized, industry-validated skill standards? To what degree is the education and training community prepared to teach

against those standards? What more is needed in terms of teaching materials, teacher professional development, career counselor training? What are the prospects for industry and government to jointly provide resources for building a voluntary, industry-led national system of skills standards, assessment and certification similar in scope, say, to the apprenticeship systems of some European countries?

Can we obtain more accurate data on global labor market competitiveness factors? For example, how many jobs are actually leaving the U.S. and moving abroad? What is the reason for these shifts? What is the nature of these jobs? How much of a threat to U.S. jobs are the burgeoning manufacturing and service industries in China?

To what degree do labor costs affect business decisions to remain in the U.S. or move jobs abroad? In what industries do capital investment and productivity improvements substantially remove labor costs as a significant factor in re-location decisions?

Do manufacturing companies that offer good pay and benefits suffer from an "image" problem? Are they lacking job applicants or applicants with the necessary skills and knowledge?

Are manufacturing jobs declining or increasing? While it is commonly stated that manufacturing is hemorrhaging jobs, why do BLS data show those jobs gradually increasing, although not as fast a rate as the population growth rate? As the nature of the manufacturing enterprise changes, especially through increased outsourcing and ICT spending, what are the trends in service jobs that are directly tied to manufacturing? Is there a better way to count those manufacturing-dependent jobs?

What is to be done, and who is responsible for doing it?

In the end, these bottom-line questions of national consequence to the United States need to be considered, analyzed, and addressed – and beginning this year. And as part of this effort, answers to the more detailed "outstanding research questions" outlined above will hopefully yield some of the necessary guidance.