



Skills for Industrial Modernization

The Report of the
Modernization Forum
Skills Commission

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Modernization Forum Skills Commission

Matthew B. Coffey, Commission Co-Chair
President
National Tooling and Machining Association

Jack Russell, Commission Co-Chair
President
Modernization Forum

Brian Bosworth, Consultant to the Commission
Principal
Regional Technology Strategies, Inc.

Anthony Carnevale
President, Institute for Workplace Learning
American Society for Training and Development

Jim Jacobs
Director of Policy Research
Macomb Community College

Gary E. Jarmer
Dean, Technical Instruction
Garden City Community College

Peter Mannella
Director, Skills Training Programs
New York State Department of Economic Development

Ray Marshall
Andre & Bernard Rapaport Chair, Economic
and Public Affairs
University of Texas, Austin

Hilary Pennington
President
Jobs for the Future

Stuart Rosenfeld
Principal
Regional Technology Strategies, Inc.

Elizabeth Brient Smith
Executive Director
National Coalition of Advanced Technology Centers

Pamela Tate
President
Council for Adult and Experiential Learning

Audrey S. Theis
Assistant Secretary
Maryland Department of Economic and Employment
Development

Vic Trunzo
Policy Analyst
U.S. Department of Labor, Office of Work-Based
Learning

Brian Turner
President
Work and Technology Institute

Perry W. Ward
President
Lawson State Community College

NIST MTC Participants

California Manufacturing Technology Center
John Chernesky, Executive Director
Joan Carvell, CMTC Liaison to California Community
Colleges

Great Lakes Manufacturing Technology Center
George Sutherland, Director

Mid-America Manufacturing Technology Center
Paul Clay, Chief Executive Officer

Midwest Manufacturing Technology Center
Michael Taback, Executive Director
Chief Operating Officer, Industrial Technology Institute

Southeast Manufacturing Technology Center
James Bishop, Executive Director
Daniel Huenink, Director of Human Resources

Northeast Manufacturing Technology Center
Mark Tebbano, Director

Upper Midwest Manufacturing Technology Center
Jan Pounds, Executive Director
Tom Huberty, Workforce Development Manager

NIST Manufacturing Extension Partnership
Gale Morse, Associate Director of Outreach

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Executive Summary

The Challenge

This report presents a national strategy to enhance the skills of workers in America's industrial foundation of small and mid-sized manufacturing firms. Foundation firms must modernize to compete. Stronger workforce skills in modernizing foundation firms will raise the performance of manufacturing in America.

Foundation firms are growing rapidly in numbers and relative importance in the United States. The 373,000 U.S. manufacturing establishments of less than 500 workers employ 12.2 million people, nearly two-thirds of the manufacturing workforce.⁽¹⁾ They have added two million jobs since 1967⁽²⁾ and produce over half of manufacturing value-added.⁽³⁾ They make most of the parts, components, and tooling required by large manufacturers. Some are innovators, developing new products and new markets. They form the broad supplier base of our great metropolitan manufacturing centers and anchor jobs in smaller cities and towns across America.

The demanding markets of the 1990s challenge our foundation firms. Unfortunately, most smaller manufacturers perform poorly compared to larger U.S. manufacturers and to the smaller firms of our trade competitors. The productivity slowdown among foundation firms has been twice as steep as among larger manufacturers.⁽⁴⁾ Smaller manufacturing establishments are 69 percent as productive as larger ones, according to the most recent data, down from 79 percent in 1967. Inevitably, the wage gap between large and small firms also has widened.⁽⁵⁾

Manufacturing in America will be stronger if thousands of foundation firms accelerate modernization of their design, production, and marketing capabilities, and the management methods that focus them. Manufacturing modernization requires that firms simultaneously master state-of-market technologies, new production methods, and high performance work processes—all of which demand substantial improvement in worker skills. Today, few of the 12.2 million foundation firm workers have the skills necessary to sustain this course.

Foundation firms and their workers will perform at higher levels only if the nation embarks on a mission:

- Pioneered in consortia of pathfinder foundation firms,
- Supported through cooperation within regional labor markets, and
- Enabled by targeted investment from federal and state governments.

Recommendations:

A Skills Program for Industrial Modernization

The Modernization Forum Skills Commission proposes a program of Skills for Industrial Modernization (SIM) to complement and enhance current federal and state industrial modernization and workforce development efforts. The program will generate Regional Skills Coalitions (RSCs) to target investment in workplace learning within consortia of firms. The SIM program will reach thousands of modernizing foundation firms and help at least one million workers acquire the skills and knowledge needed to sustain modern manufacturing. The following actions will implement the program.

Recommendation 1:

Help Foundation Firms Form Learning Consortia

The federal government led by the Department of Labor should establish Skills for Industrial Modernization (SIM) challenge grants to help modernizing foundation firms form and sustain Learning Consortia. The federal government should award funds to Regional Skills Coalitions (RSCs) through nationally competed cooperative agreements. Federal funds would be matched one-to-one by non-federal sources.

Regional Skills Coalitions would carry out the SIM program mission in regional labor markets. RSCs would focus exclusively on the skills needs of modernizing foundation firms. Federal government respect for regional experience should permit flexibility in the composition of RSCs. In some places, established coalitions might assume the role and responsibilities of an RSC. In others, RSCs would form in response to the SIM program. RSCs would consist of organizations that can serve the skills needs of foundation firms and have strong stakes in the performance of manufacturing in their regions.

Typical participants could include community, technical, and four-year colleges; the supplier development organizations of major corporations; trade associations; manufacturing technology and outreach centers; state industrial extension programs; public education districts; labor unions; private, non-profit community-based organizations; private, for-profit training providers; and, in a strong sponsorship role, state governments. RSC programs should be consistent with, complement, and enhance the modernization and skills development initiatives of host states.

The Regional Skills Coalitions would invest funds in Learning Consortia established by modernizing foundation firms that work together on skills. The consortia would match the funds from RSCs with cash and in-kind investment. The Labor Department and the RSCs would broadly disseminate the lessons from the Learning Consortia as best practice so that many more foundation firms could emulate them. Federal funding would increase over five years to \$250 million annually matched by state and local funds and then matched again by the participating firms. The goal is creation of 2,500 consortia comprised of 25,000 firms that together employ at least one million workers.

Recommendation 2:

Leverage Established Modernization Capabilities

Demand for skills *on the scale we envision* does not yet exist. It must be developed through strategic public investment that stimulates demand for high skills and demonstrates the value of education and training. Funds should leverage existing capabilities and target modernizing foundation firms in order to maximize national economic benefits.

To target its investment, the federal government should tightly link the Skills for Industrial Modernization program and the expanding national modernization infrastructure. The Manufacturing Extension Partnership (MEP) of the Commerce Department's National Institute of Standards and Technology (NIST) is the leading federal sponsor and organizer of the modernization infrastructure. The customers of the MEP's Manufacturing Technology Centers (MTCs), Manufacturing Outreach Centers (MOCs), and other deployment organizations will be the best candidates to form Learning Consortia. NIST MTCs and MOCs should actively participate in the Regional Skills Coalitions that sponsor the Learning Consortia.

Recommendation 3:

Link Related Federal Initiatives

The federal government should formalize and fund the emerging alliance between the Department of Labor and NIST. The alliance should harvest best practice from the experience of the SIM Learning Consortia, provide technical assistance and labor market analysis to established and candidate RSCs, support wide dissemination of human resource development tools crafted for use in foundation firms, and stimulate communication among practitioners of skills development and industrial modernization. The Labor Department's newly developed National Workforce Assistance Collaborative (NWAC) and its Training Technology Resource Center (TTRC) can contribute significantly to this work.

The Skills for Industrial Modernization program should be linked to other federal initiatives that can enhance and be enhanced by its mission. SIM Learning Consortia would make excellent partners for the school-to-work transition program now under joint development by the Departments of Labor and Education. The Labor Department has envisioned "one-stop" career centers that could be valuable resources for the SIM Learning Consortia, especially if the SIM program's Regional Skills Coalitions develop plans that can link such centers and the consortia.

At the scale we envision, the SIM Program could stimulate broader action by large manufacturing corporations; foundation firms; trade associations; labor unions; public education; community, technical and four-year colleges; modernization agencies; state governments; community-based and non-profit organizations; and other parties interested in enhancing skills to support industrial modernization.

Principles to Guide Policy, Program and Practice

The Skills for Industrial Modernization program will yield the highest returns on investment if guided by the following principles.

1) Place skills development within a comprehensive modernization strategy.

Manufacturing modernization is complex. Modernizing firms attempt interdependent and often simultaneous development of their design and production technologies, worker skills, work organization, market focus, customer and supplier relationships, and management practices. Programs focused only on training may fail. Education and training programs should integrate skills development into a comprehensive modernization strategy.

2) Strive for high performance work organization.

High performance work organizations fully use workers' skills, involving them in the planning and implementation of changes at the firm. The public and private sectors will benefit little from investments in education and training unless new skills are deployed in firms where the organization of work enhances worker participation and uses skills effectively. Workers and managers are far more likely to seek and apply higher skills if they have direct responsibility for organizational performance and customer satisfaction and can act on that responsibility. For the modernizing firm, worker participation is a key business strategy. Modernization agencies and training providers should help firms link training to work reorganization. New modes of work must increase the capability and commitment of workers and help build formal and informal learning systems within firms.

3) Make learning, not just training, the goal.

As the pace of economic and technological change accelerates, the ability of workers and enterprises to learn and adapt becomes a core element in the global competition among corporations and national economies. Manufacturing enterprises acquire much of the learning critical to their economic success as they engage customers, conceive and develop new products, and plan, implement, and optimize new design and production technologies and methods. Foundation firms strengthen regional economies when their cultures, work processes, and structures capture knowledge and encourage collaborative learning.

4) Embed skill enhancement in work processes.

Workers learn new skills best on the job. Work provides them with a context that links application of new knowledge to work interests and career goals. Modernization and education organizations should structure on-the-job training to enhance the skills and knowledge of workers performing modern work processes. Education and training should be embedded in the new design and process technologies used by foundation firms. Foundation firms will gain most from their limited dollars when they invest in work-based learning. Foundation firms generally avoid elaborate, formal training systems but will use ones that allow workers to learn as they produce.

5) Promote consortial approaches by groups of firms committed to joint learning.

The grand challenge of developing skills for industrial modernization dictates a consortial strategy. There is no other way to enhance the skills of 12.2 million workers at 373,000 establishments. New public investments in the skills of the current industrial workforce should, like the rest of the modernization system, promote inter-firm cooperation. Consortial approaches use finite funds efficiently, aggregate demand of modernizing firms, enhance their market power, promote virtuous peer pressure, leverage the innovations of individual lead firms, and harvest best practice from team work.

6) Target resources to leverage lessons from pathfinder firms.

The public sector should target its limited resources to develop and disseminate best practices among consortia of foundation firms that take the high and risky road of aggressive modernization. Federal and state governments should allocate funds on a competitive basis through coalitions of organizations that broker the full range of assistance needed by modernizing firms. Pathfinder firms can develop approaches to high performance work organization and workplace learning that become models for thousands of kindred firms.

7) Reward cooperation within regional labor markets.

The federal government should allocate new federal funding for skills for industrial modernization on a competitive basis to coalitions of organizations with the ability to meet the skills needs of foundation firms and strong stakes in the performance of manufacturing in their regions. The coalitions should serve regional labor markets, assess the near- and long-term skills needs of foundation firms, and develop plans to meet those needs. Their programs should be consistent with, complement, and enhance state-level modernization and workforce development initiatives. Their most important function should be to invest public funds, on a matched basis, in model skills development projects that consortia of leading foundation firms propose and conduct. Coalitions should compete to receive and renew federal and state support based on their ability to bring the right players to the table, work with foundation firms, generate high-quality projects with regional impacts, and draw and disseminate lessons for regional, state, and national benefit.

8) *Provide dynamic benchmarks, not static standards.*

Firms and their workers need better systems to set skills targets and gauge progress. Static standards based on average practice are not suitable because the skills required of workers in flexible, technically dynamic enterprises change frequently. Periodic standards setting does not sustain collaborative relations among manufacturers, educators, and other training providers. The national initiative to establish a voluntary national system of skills standards provides an opportunity to create a dynamic benchmarking system that consistently promulgates current best practices to guide the investment of foundation firms, workers, and governments in skill development.

9) *Build school-to-work transition bridges for the skilled workers of tomorrow.*

New initiatives to improve the school to work transition of young people should be especially responsive to the skill requirements of smaller manufacturers. When foundation firms in SIM Learning Consortia identify needs for new skills and new workers, school-to-work programs in regions with a SIM RSC should support, work with, and learn from the coalition and the consortia it sponsors. Educational institutions at all levels should prepare new entrants to manufacturing employment at managerial and technical levels, and they should do so in ways that meet the needs of firms choosing the challenging path of high technology and high performance work organization.

I. Modernization of America's Industrial Base Requires Skilled Workers and Firms Committed to Workplace Learning

To perform in the emerging global marketplace, American manufacturers must master new technologies, techniques, and methods of work organization. Our society will be richer if many firms take this path of continuous modernization. The challenge is acute for *foundation firms*, the small and mid-sized manufacturers that are the broad base of American industry.

Foundation Firms Are Vital to U.S. Manufacturing

Manufacturing in the United States is increasingly performed by smaller enterprises. Some 98 percent of America's 378,000 manufacturing establishments employ fewer than 500 workers.⁽¹⁰⁾ Their share of the industrial workforce has grown over the past 20 years. As large manufacturing corporations have shed over 1.2 million

jobs, smaller establishments have added 2.2 million.⁽¹¹⁾ The 12.2 million Americans now employed by foundation firms constitute 64 percent of the industrial workforce⁽¹²⁾ and produce over half of the value added to U.S. manufacturing.⁽¹³⁾

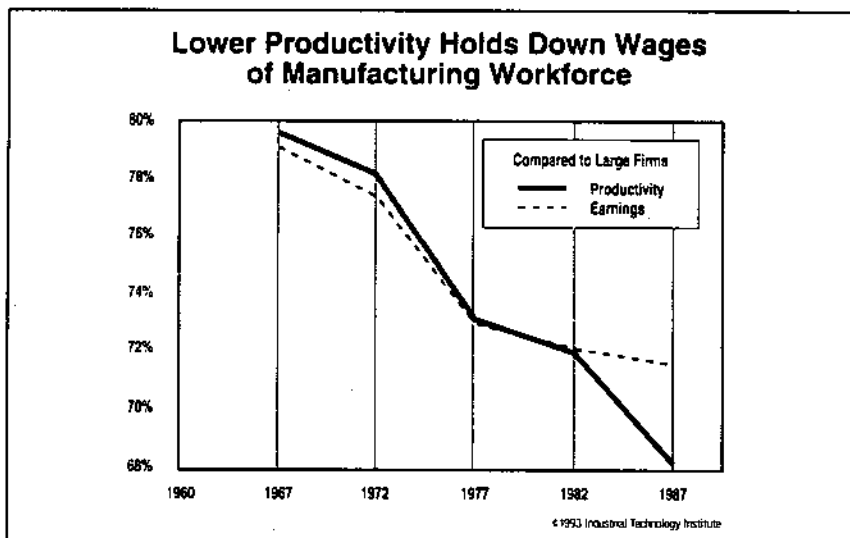
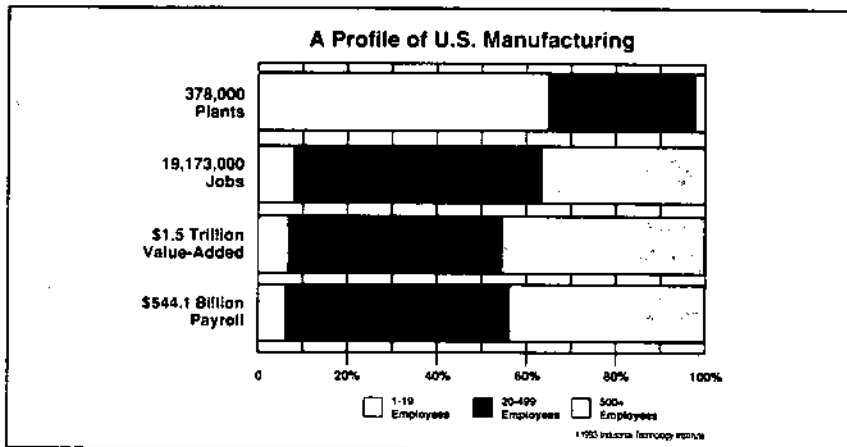
Seemingly contradictory currents drive the growth of smaller enterprises. Some larger companies, challenged in their once-secure North American markets, have outsourced to smaller, low-wage, lower-cost independent suppliers. Some highly talented, technically modern smaller firms have nimbly spotted new market niches and quickly shifted capacity to emerging opportunities.

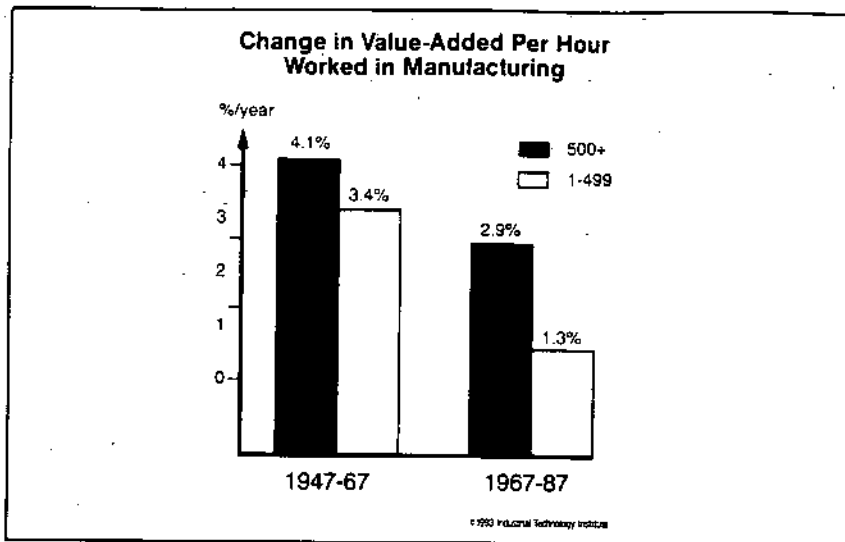
Many foundation firms are brilliantly managed enterprises that provide good jobs and essential capabilities. Overall, however, the growing role of small firms in American manufacturing has not enhanced our national economic

competitiveness. As our manufacturing productivity growth rate has slowed since the late 1960s, the decline has been *twice as steep* in foundation firms where value-added per hour worked has grown at a weak 1.3 percent per year on average.⁽¹⁴⁾ In 1967, smaller manufacturing establishments were 79 percent as productive as larger ones; according to the most recent data, they are only 69 percent as productive. Inevitably, the large firm/small firm wage gap has also widened.⁽¹⁵⁾

It is in America's interest that many foundation firms take the demanding road to successful competition in the markets that reward distinctive capability with prices that can support good wages. If more take the alternative path, driving production cost and wages down toward the levels of less industrialized nations, the standard of living and quality of life for many Americans will decline. Large multi-national corporations can relocate manufacturing operations to regions of the world with lower costs of production. As they do, high wage jobs are lost here at home. Foundation firms are rooted in their communities. Their success will drive growth in America.

The American economy will be stronger if thousands of foundation firms





accelerate modernization of their design, production, and marketing capabilities and the management methods that focus them. Only modern firms will compete successfully in the market of the future. Only modern firms will pay good wages.

Manufacturing Modernization Is Multi-Dimensional Change

Manufacturing modernization is a complex process of managing simultaneous change across several elements of the firm, the most important of which are:

Technology: Firms competing in the most rewarding and demanding markets must master computer-based technologies and methods for design, engineering, requirements planning, fabrication, assembly, materials handling, in-process inspection, and inventory management. In the modern shop, computers control and integrate machines, cells, production and office functions, and most inter-firm communication. Smaller firms need help as they choose, install, integrate, and optimize these technologies.

Markets: The most rewarding markets are often international in scope, highly segmented, and volatile. Small manufacturers accustomed to local, homogeneous, stable markets must develop new skills in market analysis and new sales channels.

Work Organization: More sophisticated, high-value added production is typically the domain of flexible enterprises that must meet customer requirements for quality, reliability, precision, engineering content, and quick delivery. Centralized and hierarchical work organization blocks such objectives. Modernizing firms must move toward flexible, high performance work organization, the main attributes of which are flat management structures, job

rotation, employee involvement in problem solving, and employee work teams with significant autonomy and authority.

Skills: Managers and workers in modernizing foundation firms often need new occupational, technical, and problem-solving skills to optimize advanced technology and flexible work organizations. Even leading-edge foundation firms have found that developing advanced technical skills may first require upgrading the basic literacy, numeracy, and communication skills of their employees.

Finance: Firms that explore new markets, acquire modern technologies, and invest in skills often must develop new competence in business finance and credit and capital management.

Inter-Firm Cooperation: Foundation firms discover that modernization requires new skills and mechanisms for managing their relationships with other companies. Customer firms and suppliers practice concurrent engineering. Kindred and even competing foundation firms also form marketing and production alliances. Smaller firms often lack experience in collaboration to pursue joint solutions to common problems, including cooperative development of learning systems.

Advanced Business Management Practices: Smaller firms cannot organize inter-related, simultaneous change in all the dimensions above without using advanced business management practices. It is daunting but necessary for foundation firms to adopt strategic planning and total quality management practices.

Because modernization involves multi-dimensional change, foundation firms will not sustain modernization unless their employees can acquire the knowledge and skills essential for high performance manufacturing. Today, few can.

In America, no coherent system invests in the abilities of the 12.2 million workers in small and mid-sized manufacturing establishments. The education and previous employment of most foundation firm workers has not developed the technical, problem solving, and teamwork abilities essential to modern, high performance manufacturing. Few schools foster teamwork in education or see foundation firms as customers. Few firms organize work in ways that encourage work-based learning.

II. Barriers to Building Skills for Industrial Modernization

The development of skills required for industrial modernization presents significant challenges to foundation firms, workers, education and training agencies, the federal and state governments, and organizations promoting modern manufacturing. All of these parties must work together to invest in the skills of currently employed workers, link education and training to workplace needs, encourage high performance work organization, and foster broad-based learning within firms. To do so, they must overcome many pressing problems.

Most foundation firms invest little in the skills of their workers and are not organized to take full advantage of existing skills. Many small firms believe they lack the money, time, and information needed to upgrade worker capabilities. Small manufacturers have been reluctant to commit dollars and people to skills development. Few owners and managers have the background and patience needed to develop learning systems and training programs. They lack time to assess their skills needs and deal with training providers. Small firms have inadequate information about skills benchmarks by which to gauge the learning needs of their workers.

Foundation firms are not exposed to the potential benefits of flexible, high performance work organization that fully utilizes worker skills. There are few well-documented cases of kindred firms prospering through investment in training and few mechanisms for small manufacturers to learn from the experiences of those that do.

Price pressures from large industrial customers often discourage expenditures for training and push firms toward the low-wage, low-skill option. Many small manufacturers under-invest in training because they fear that other firms will pirate newly trained workers away from them. Even firms with an interest in training often lack the market power to secure it at a price they believe they can afford. Nor do they often have the political experience or time to rally their peers to a collective engagement with training providers.

The workers in foundation firms lack support systems for learning and have few incentives to pursue and apply advanced skills. Workers rarely have an opportunity to understand—much less help shape—firm strategy, and thus they have little sense of how broadening and deepening their skills might benefit both them and the firm. They often are unaware of how they can acquire new skills and what skills will make them more employable at higher wage levels.

Foundation firm workers have little or no access to skills assessment, counseling, and career planning. They gen-

erally know very little about the limited government assistance available to help them pursue education and skill development on a part-time basis and are reluctant to use programs that require up-front investment from individuals. Because skill benchmarks are available in few occupations, workers have little opportunity to gauge their capabilities against industry standards or to relate skill development to career opportunity. They receive little credit for the informal learning that takes place on the job.

Education and training institutions have not focused on developing learning systems within foundation firms. Few educational and training institutions are skilled in the design and transfer of methodologies that advance flexible work organizations and intra-firm learning systems. Typically, they have focused on building the skills of individuals through training without developing the capabilities of firms to promote learning.

Too often funding formulas for education and training discourage work with smaller firms, so many education and training institutions have no real experience with foundation firms. Where they do, they usually prescribe only narrow on-the-job training.

Existing regional labor market institutions have difficulty meeting the disaggregated needs of foundation firms and have neither the mandate nor means to facilitate consortial action among firms. The Employment Service and Job Training Partnership Act organizations have important missions to serve the needs of unemployed, disadvantaged, and dislocated workers. They cannot and should not be asked to focus on upgrading the skills of currently-employed foundation firm workers. They are not well connected with foundation firms, lack the staff to assess their long-term skill requirements, and have no incentive to re-orient their missions toward the needs of such firms and workers.

To date, government efforts to help incumbent manufacturing workers learn higher skills have been limited. Federal funds for skill development are available almost exclusively to the unemployed and disadvantaged. With the commendable exception of the recent alliance between the Labor Department's Employment and Training Administration (ETA) and the National Institute for Standards and Technology (NIST), federal government programs do not yet embrace the connections among training, work re-organization, and the other dimensions of manufacturing modernization.

Traditionally, government programs have focused on formal classroom training and have not accommodated informal on-site training. Federal and state training

resources are seldom available to address needs of incumbent manufacturing workers for assessments, long-term skills development planning, technical assistance and guidance, and the development of new educational products or services.

In the last decade, some states explored new approaches. Several industrial states have developed programs to provide skills upgrading assistance to incumbent workers. The programs are usually targeted to small and midsized firms, but at present still probe for approaches to ensure strategic investment and strong returns. Some states now manage training resources from within their modernization or economic development agencies. These states are evolving models that link skills development with manufacturing modernization and competitiveness objectives.

These promising initiatives seek to overcome limitations in the way most government programs are structured to deliver training. Many states allocate funds through traditional training agencies to training providers and education agencies, requiring significant efforts for coordination with the primary customers—the affected firms and workers.

While these problems are significant, each can be overcome. A necessary first step is to define the principles that should guide skills initiatives for industrial modernization.

III. Principles to Guide Policy, Program, and Practice

Skills policies and programs aimed at the modernization of America's industrial base will require coordinated actions across a very broad front and sustained commitment over several years. We believe this mission should be guided by the following principles.

1. Place skills development within a comprehensive modernizing strategy.

Manufacturing modernization is complex. Modernizing firms attempt interdependent development of their design and production technologies, worker skills and work organization, customer and supplier relationships, market focus, and management practices. Job training does not drive modernization, so programs focused on training alone will be less effective. Successful programs will base skills development on how modernizing firms learn what they need to know.

Because foundation firm modernization requires simultaneous change across several dimensions, assistance to firms should be integrated across these same dimensions. Programs that assist busy foundation firms must combine services in a comprehensive, time-efficient approach.

Skill development programs aimed at workers in foundation firms can be carried out most effectively by tight partnerships between industrial modernization organizations with the scale to serve hundreds of customer firms and training providers who understand the broader dimensions of manufacturing modernization and can perform well for smaller firms. Because the primary business of modernization organizations is direct service to foundation firms, they would typically manage comprehensive projects that include skills development and maintain long-term relations with customer groups. Community colleges and comparable educational institutions would typically deliver training services based on their expertise in skills development. Resourceful organizations supporting smaller manufacturing regions may deliver training and some modernization services. All comprehensive assistance interventions should promote worker participation.

Correspondingly, federal strategy should not treat worker training and manufacturing modernization as unrelated challenges to be addressed through separate initiatives and delivered by separate organizations. The federal government should not further fragment administrative responsibility for job training. Any new federal worker training initiatives should be administered by established centers of expertise within the U.S. Departments of Labor and Education and coordinated with the industrial modernization mission of the Department of Commerce.

2. Strive for high performance work organization.

High performance work organizations fully use workers' skills, involving them in the planning and implementation of changes at the firm. The public and private sectors will benefit little from investments in education and training unless new skills are deployed in firms where the organization of work enhances worker participation and uses skills effectively.

Workers and managers are far more likely to seek and apply higher skills if they have direct responsibility for organizational performance and customer satisfaction and can act on that responsibility. For the modernizing firm, worker participation is a key business strategy. Modernization agencies and training providers should help firms link training to work reorganization. New modes of work must increase the capability and commitment of workers and help build formal and informal learning systems within firms.

Federal and state policies must encourage firms to embrace the broader issues of worker skill and work organization. A focus on narrow training would breed preoccupation with the provider side of the delivery system rather than the real needs of small firms and workers.

To support the objective of high performance work organization, public investment should build capacity in those education and training organizations that serve modernizing foundation firms. Resources should be broadly available to help firms reorganize work processes, expand worker participation, and support skills assessment, guidance, educational planning, and skill upgrading for workers.

3. Make learning, not just training, the goal.

As the pace of economic and technological change accelerates, the ability of workers and enterprises to learn and adapt becomes a core element in the global competition among corporations and national economies. Manufacturing enterprises acquire much of the learning critical to their economic success as they engage customers, conceive and develop new products, and plan, implement, and optimize new design and production technologies and methods. Foundation firms strengthen regional economies when their cultures, work processes, and structures capture knowledge and encourage collaborative learning.

4. *Embed skill enhancement in work processes.*

Workers learn new skills best on the job. Work provides them with a context that links application of new knowledge to work interests and career goals. Modernization and education organizations should structure on-the-job training to enhance the skills and knowledge of workers performing modern work processes. Education and training should be embedded in the new design and process technologies used by foundation firms. Foundation firms will gain most from their limited dollars when they invest in work-based learning. Foundation firms generally avoid elaborate, formal training systems but will use ones that allow workers to learn as they produce.

5. *Promote consortial approaches by groups of firms committed to joint learning.*

The grand challenge of developing skills for industrial modernization dictates a consortial strategy. There is no other way to enhance the skills of 12.2 million workers at 373,000 establishments. New public investments in the skills of the current industrial workforce should, like the rest of the modernization system, promote inter-firm cooperation. The consortial approach uses finite funds efficiently, aggregates the demand of modernizing firms, enhances their market power, promotes virtuous peer pressure, leverages the innovations of individual lead firms, and harvests best practice from team work.

Some firms will seek and pay for training on their own, but there will never be sufficient public resources to support single firm service as the primary means of providing skills for industrial modernization. Smaller manufacturers are often ignored when they act alone. Acting together, they become a collective customer with authority comparable to that of much larger corporations. Foundation firms that aggregate their demand will secure more effective service from training providers. Collective consumption of services will drive down the cost to individual firms.

Recent initiatives in Europe and our own experience as service providers in the United States suggest that inter-firm cooperation has enormous potential to accelerate the modernization process by promoting shared learning among firms. Companies can pool their training needs,

compare experience, and benefit from collective gence, especially in implementing new approaches. quality management and participatory work organization. Leaders of small firms learn best from one another even as they compete.

Our strategy is based on the exemplary power of pathfinder firms that model the high road of sustained modernization. Maximum cross-fertilization among leading foundation firms is essential to the success of our strategy. Group projects will forge such links. Discovery of best practice confirmed in teamwork has power.

6. *Target resources to leverage lessons from pathfinder firms.*

The public sector should target its limited resources to develop and disseminate best practices among consortia of foundation firms that take the high and risky road of aggressive modernization. Federal and state governments should allocate funds on a competitive basis through coalitions of organizations that can broker the full range of assistance that modernizing firms need. Pathfinder firms can develop approaches to high performance work organization and workplace learning that become models for thousands of kindred firms.

Too frequently, education and skill development programs are based on the apparent needs of common practice firms. They are designed to meet the skill requirements for workers in relatively segmented and narrow task boundaries. The quality of work preparation therefore perversely affects its demand. Staffed by workers and managers unprepared for high performance work organization, common practice firms avoid instituting work systems that would heighten demand for new skills. This cycle can be interrupted by targeted investment that challenges and supports firms to modernize.

Resources should be allocated only to foundation firms. Workers in larger corporations also need skills development, but there are substantially greater training and education resources available to large firms. The leverage of public funds in large firms is limited, since the assistance is marginal to the scale of need and hence cannot induce change within the firm. However, large firms can help support training consortia among their suppliers, share their training facilities, and validate the importance of high performance work organization and workplace learning as desirable supplier practices.

Targeting resources to pathfinder foundation firms would have a major national impact if done at a serious scale rather than through policy pilots. To illustrate one model, assume that:

- Most participating foundation firms employ at least 20 workers,
- 20 percent of the manufacturers with 20-499 employees participate,
- Each firm invests \$1,000 per worker per year, or a minimum of \$20,000,
- Each firm's investment is leveraged in a consortia of five to 15 firms, and
- Governments match each consortial investment dollar for dollar.

In this case, some 2,000 to 3,000 skills consortia across the country would aggregate the demand of leading foundation firms at work on the human resource dimensions of industrial modernization. Consortia with annual budgets of between \$200,000 and \$600,000 would command the attention of service providers. Nationally, firms and government would invest an annual total of \$1 billion. At this scale, best practice would be confirmed in powerful exemplars, many more firms would follow the leaders, and stronger markets for skill development would evolve.

7. Reward cooperation within regional labor markets.

A national infrastructure is being built to support industrial modernization. Its public and private proponents and practitioners at the federal, state, and regional level recognize that the best approach to service delivery will vary with the industrial mix, institutional arrangements, and political geography of regions. Federal investment should drive national objectives and set performance standards while encouraging regional ingenuity.

Federal support of regional flexibility is especially appropriate when targeting new public investment in skills for modernization. The arena of organizational orchestration and action should be regional labor markets which usually correspond to the service regions of larger modernization organizations.

With few exceptions, the structures that deliver the established federal programs for workforce education and training are not appropriate to the mission of skills development in the foundation firm workforce. Programs for unemployed, disadvantaged, and dislocated workers fulfill an essential social responsibility and are a wise public investment. A skills for industrial modernization program should not compete with the mission of such traditional programs. We hope to build a strong interface between programs that return workers to employment and programs that widen their capabilities at work.

However, it would be redundant, expensive, and confusing to create a new nationally uniform system of sub-state labor market institutions. A more practical approach is coalitions of organizations with the ability and incentive to enhance the skills of modernizing foundation firms. The federal government should respect regional experience and permit flexibility in the composition of coalitions. In some places, established coalitions might assume the new role and responsibilities; in others, they would form in response to the new program. The work of coalitions should be consistent with, complement, and enhance the modernization and skills development initiatives of host states. If states have established human resource investment councils, industrial modernization councils, or comparable substate bodies, the coalitions that implement the skills for industrial modernization program should develop proposals and plans with the oversight of these bodies.

8. Provide dynamic benchmarks, not static standards.

Firms and workers need better systems to set skills targets and gauge progress. Static standards based on average practice are not suitable because the skills required of workers in flexible, technically dynamic enterprises change frequently. Nor does periodic standards setting alone sustain cooperative relations among manufacturers, and educators, and other training providers. The national initiative to establish a voluntary national system of skills standards provides an opportunity to create a dynamic benchmarking system that consistently promulgates current best practices to guide the investment of foundation firms, workers, and governments in skills development.

9. Build transition bridges for the skilled workers of tomorrow.

In some manufacturing sectors, many workers are more than 50 years old. Frequently, the most highly skilled workers are among the oldest. For many foundation firms, the outlook for replacement workers is bleak. The pervasive myth of a post-industrial economy has discouraged most young people from pursuing careers in manufacturing.

New initiatives to improve the school to work transition of young people should be especially responsive to the skill requirements of smaller manufacturers. When foundation firms identify needs for new skills and new workers, school-to-work programs should support, work with, and learn from the firms. Educational institutions at all levels should prepare new entrants to technical and managerial jobs in manufacturing in ways that meet the needs of firms that have chosen the challenging path of high technology and high performance work organization.

IV. Recommendations: Skills for Industrial Modernization

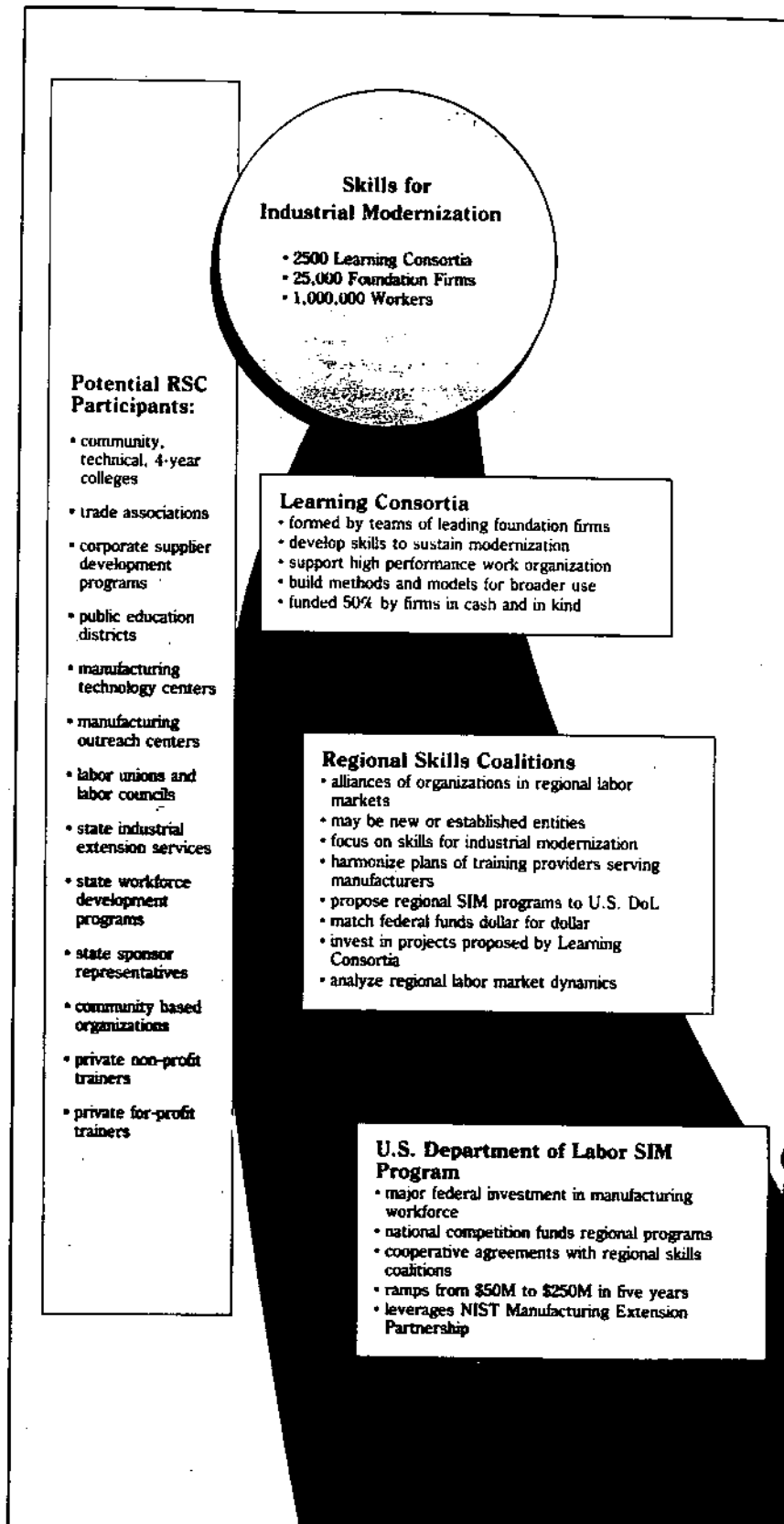
We propose a program of Skills for Industrial Modernization (SIM) based on the needs and principles presented above. The program will generate Regional Skills Coalitions (RSCs) to target investment in workplace learning within consortia of firms. The SIM program will reach thousands of modernizing foundation firms and help at least one million workers acquire the skills and knowledge needed to sustain modern manufacturing. We make the following recommendations to implement the Skills for Industrial Modernization program.

Recommendation 1: Help Foundation Firms Form Learning Consortia

The federal government led by the Department of Labor should establish Skills for Industrial Modernization (SIM) challenge grants to help modernizing foundation firms form and sustain Learning Consortia. The federal government should award funds to Regional Skills Coalitions (RSCs) through nationally competed cooperative agreements. Federal funds would be matched one-to-one by non-federal sources and should not be earmarked or awarded by formula.

Regional Skills Coalitions would carry out the SIM program mission in regional labor markets. RSCs would focus on the skills needs of modernizing foundation firms. They would consist of organizations that can serve those needs and have strong stakes in the performance of manufacturing in their regions.

The specific composition, configuration, and division of responsibility within the coalitions would be shaped by regional circumstances and the goals and established initiatives of regional and state leadership. In some places, established coalitions might assume the role and responsibilities of



an RSC. In others, RSCs would form in response to the SIM program.

Typical participants could include community, technical, and four-year colleges; the supplier development organizations of major corporations; trade associations; manufacturing technology and outreach centers; state industrial extension programs; public education districts; labor unions; private, non-profit community based organizations; private, for-profit training providers; and, in a strong sponsorship role, state governments. RSC programs should be consistent with, complement, and enhance the modernization and skills development initiatives of host states. If states have established human resource investment councils, industrial modernization councils, or comparable substate bodies, the coalitions that implement the skills for industrial modernization program should develop proposals and plans with the oversight of these bodies.

The opportunity to win substantial and sustained federal funding for skills development in their regions should spur formation of the Regional Skills Coalitions. Matching fund requirements should assure that they are responsive to and consistent with state objectives. RSCs would work at the level of the regional labor market, assessing the near- and long-term skills needs of foundation firms, harmonizing the plans of service providers who can meet those needs, and, most importantly, investing their federal and state funds in skills development projects proposed by consortia of leading foundation firms.

Regional Skills Coalitions would compete for federal and state support based on their ability to bring the right players to the table, achieve cooperation, maintain a program of high-quality projects with regional impact, and draw lessons for regional, state, and national benefit.

The primary objective of the Skills for Industrial Modernization program will be to stimulate very large numbers of leading foundation firms to enhance their commitment to skills development and learning in the workplace. The RSCs would invest funds in projects carried out by groups of modernizing foundation firms.

Foundation firms would form *Learning Consortia* to propose and carry out projects that embody the principles of the SIM program. Manufacturing firms with less than 500 employees would be eligible to propose projects to Regional Skills Coalitions if they team in consortia of five or more firms and bear at least half the total costs of the proposed project in cash and in kind. The RSC would require strong linkages between the skills development agenda laid out in proposed projects and the broader modernization efforts of firms in the consortia. Funds would be targeted to consortia whose projects develop approaches and capabilities that could be leveraged for wider use.

The Labor Department and the RSCs would broadly disseminate the lessons from the Learning Consortia as best practice so that many more foundation firms could emulate them. Federal funding would increase over five years to \$250 million annually matched by state and local funds and then matched again by the participating firms. The goal is creation of 2,500 consortia comprised of 25,000 firms that together employ at least one million workers.

Recommendation 2: Leverage Established Modernization Capabilities

Demand for skills *on the scale we envision* does not yet exist. It must be developed through strategic public investment that stimulates demand for high skills and demonstrates the value of education and training. Funds should leverage existing capabilities and target modernizing foundation firms in order to maximize national economic benefits.

To target its investment, the federal government should tightly link the Skills for Industrial Modernization program and the expanding national modernization infrastructure. The Manufacturing Extension Partnership (MEP) of the Commerce Department's National Institute of Standards and Technology (NIST) is the leading federal sponsor and organizer of the modernization infrastructure. The customers of the MEP's Manufacturing Technology Centers (MTCs), Manufacturing Outreach Centers (MOCs), state industrial extension programs assisted by the NIST STEP program, and other deployment organizations will be the best candidates to form Learning Consortia. NIST MTCs and MOCs should actively participate in the Regional Skills Coalitions that sponsor the Learning Consortia.

Recommendation 3: Link Related Federal Initiatives

The federal government should formalize and fund the emerging partnership between the Department of Labor and Commerce's NIST. This partnership should harvest best practice from the experience of the SIM Learning Consortia, provide technical assistance and labor market analysis to established and candidate RSCs, support wide dissemination of human resource development tools crafted for use in foundation firms, and stimulate communication among practitioners of skills development and industrial modernization. The Labor Department's newly developed National Workforce Assistance Collaborative (NWAC) and its Training Technology Resource Center (TTRC) can contribute significantly to this work.

The Skills for Industrial Modernization program should be linked to other federal initiatives that can enhance and be enhanced by its mission. SIM Learning Consortia would make excellent partners for the school-to-work transition program now under joint development by the Departments of Labor and Education. The Labor Department has envisioned career centers that could be valuable resources for the SIM Learning Consortia, especially if the SIM program's Regional Skills Coalitions develop plans that link such centers and the consortia.

To guide, enhance, and leverage the SIM program as it reaches scale, the federal government, through joint action by the Departments of Labor, Education, and Commerce, should establish a national alliance of organizations distinguished by their exemplary practice in service to the SIM program mission. The alliance would bring together best practice manufacturing firms, trade associations, labor organizations, manufacturing centers; state training agencies, school districts, and community, technical, and four-year colleges. The alliance would oversee a federally-funded center that develops and disseminates new approaches to skill development, work organization, manufacturing skill benchmarking, and enterprise learning systems. Among the contributions of the alliance and center would be to:

- Advance the concepts of high performance work organization and workplace learning through sponsored research, conferences, and award programs,
- Evolve an approach to benchmarking the manufacturing skills of workers in best practice foundation firms,
- Develop a model curriculum to help foundation firms explore the forms of high performance work organization and participatory work structures appropriate to them, and
- Promote a nationally portable associate degree program in manufacturing management and technology using as a model the training program for machinists and tool and die makers developed by the National Tooling and Machining Association. The program would emphasize all the dimensions of performance associated with success in the modernizing foundation firm.

Actions Stimulated by the SIM Program.

If implemented at the scale we envision, a Skills for Industrial Modernization Program could stimulate actions by many parties with the interest and collective capability to enhance what a million or more foundation firm workers

know and do. Below, we suggest what each party might do based on their specific interests, capabilities, and resources.

Large Manufacturing Corporations could help their foundation firm suppliers develop improved work organizations and enhance worker skills. Large firms could drive industry standards. They could build awareness and demand for the changes foundation firms must make: sustain modernization by giving greater emphasis to flexible work organization, in-firm learning systems, and employee skills in their supplier certification, assessment, and training programs. Regional Skills Coalitions could include senior procurement executives at large firms and managers of large firm plants with strong regional supply bases.

Leading Foundation Firms could, through participation in SIM program consortia, develop learning systems with their firms and learning alliances with local education and training organizations. Foundation firms could create incentives for learning, install mechanisms to sustain skill development within their enterprises, strengthen inter-firm cooperation, learn from the experience of other companies, and pool investments in training. They could work through networks and trade associations as players in Regional Skills Coalitions.

Trade Associations could build SIM program consortia among member firms and facilitate collaborative approaches to organizing work and enhancing worker skills. They could develop and disseminate information about best practice companies within their membership, describing the learning systems and skill enhancement efforts of leading firms. Trade associations could become a stronger common voice for foundation firms in national policy debates on workforce skills. They could be important members of Regional Skills Coalitions.

Labor Organizations develop policies and programs encouraging workers to participate in high performance work organization for more satisfying, safer, more secure, and higher wage work, and they could identify and eliminate barriers to increased learning in firms and education systems. Unions could develop education campaigns to meet the changing skill requirements for participating in modern manufacturing and also facilitate the establishment of skills assessment and career counseling programs for workers in foundation firms. They could help workers and firms establish economic incentives to improve skills and performance. Labor representatives could participate in Regional Skills Coalitions.

Public Education could expand tech prep and youth apprenticeship initiatives in manufacturing occupations. Educators could seek relationships with modernization organizations and modernizing firms. District leaders could refocus industrial arts and technology programs, shifting the

emphasis from low-skill, low-wage manufacturing to the higher order skills required in modernizing firms. They could make funds for adult education available directly to firms to help them improve the basic literacy, numeracy, and communication skills of currently employed manufacturing workers. Representatives of K-12 systems could participate in Regional Skills Coalitions.

Community, Technical, and Four-Year Colleges could design new programs that develop the skills of foundation firm managers and workers and help them build learning systems within their firms. Colleges should tightly link their work with foundation firms to the modernization assistance programs in their region, integrating what they offer into a comprehensive set of services for modernizing firms. They could assist model foundation firms in benchmarking worker skills and learning systems. The colleges should assure worker involvement in the design of their formal off-the-job and customized on-the-job training programs and develop assessment tools to measure and credit the informal on-the-job training provided by foundation firms. Based on these capabilities, community, technical, and four-year colleges generally would deliver the majority of services commissioned by the foundation firm consortia of the SIM program, and be essential members of Regional Skills Coalitions.

Modernization Agencies should assure that skill development services are provided within the context of a comprehensive system of multi-dimensional assistance. Typically, larger modernization agencies such as NIST

MTCs would maintain the ongoing customer relationship with foundation firms that establish skill consortia through the SIM program. Modernization agencies would typically help firms form and maintain their learning consortia. They would be essential members of Regional Skills Coalitions.

State Governments should work closely with federal agencies to coordinate industrial modernization strategies. States could organize or augment state-financed, customized job training programs that focus on skills development and workplace learning in foundation firms. They could support exemplary practices by firms in the areas of work reorganization, worker involvement, and worker skill planning.

Some states should change the way their colleges are financed so as to provide greater support for training of currently employed workers and tuition support for on-site, customized training that builds high performance work organization. States should have funding formulas that reward colleges for offering individually designed, non-degree programs to adults seeking to advance their skills through part-time education and training.

As the leading source of matching funds for Regional Skills Coalitions that seek to participate in the federal SIM program, state governments should orchestrate the contributions of multiple RSCs within their states and should take a seat of special authority at RSC tables.

V. Communicating Our Perspective

The commissioners who authored this report are practitioners close to the challenges addressed here. The commission was convened by the presidents of the Modernization Forum and the National Tooling and Machining Association. They invited leaders from community colleges; state training agencies; skills-oriented coalitions of companies, unions, and community colleges; other education and training organizations; the U.S. Department of Labor; the National Institute for Standards and Technology (NIST); and the seven regional manufacturing technology centers established by NIST.

We came together in January 1993 at a moment of national promise, believing that our unified perspective might help new leadership coalesce two emerging federal initiatives: industrial modernization focused on small and midsized manufacturers and skills development focused on present and future manufacturing workers.

Our practitioners' wisdom is summarized in this report. As a temporary commission, our goal has been to develop and communicate the analysis and recommendations offered here. In that sense, our job is done. However, we know full well that we join an already lively discussion. We will be gratified if this report contributes a fresh perspective and agenda that enhances the dialogue. We conclude with a few practical suggestions for those who wish to work with us to disseminate and develop the perspective.

Distribution of Skills for Industrial Modernization. We encourage organizations to distribute our report to their members. Please contact the Modernization Forum to discuss arrangements.

Speakers. Individuals who served on the Modernization Forum Skills Commission are prepared to speak on our perspective at conferences and meetings. Please contact individual commissioners or the Modernization Forum.

Briefings. Commissioners are willing to brief relevant decision makers in public and private organizations. Please contact individual commissioners or the Modernization Forum.

Testimony. Commissioners are prepared to make written and oral statements for legislatures. Please contact individual commissioners or the Modernization Forum.

Federal Legislation. A team of commissioners is working on federal legislation. As we progress, we will welcome assistance and critical reviews from interested parties.

Model State Legislation. We would welcome an opportunity to work with others in developing model legislation for states.

Pilot Projects. We expect that elements of the SI program will soon be tested in pilot projects to confirm and extend our perspective. We look forward to discussions with potential pilot partners as opportunities arise.

As leaders, we believe in exemplary action. Within the limits of our own organizations, we are implementing our recommendations. We look forward to working with those who share our perspective as we develop this essential component of the mission to modernize America's industrial base.

Endnotes:

1. U.S. Department of Commerce, Bureau of the Census, *County Business Patterns 1990: United States* (Washington, D.C.: U.S. Government Printing Office, January 1993), Table 1b.
2. *Ibid.*; and U.S. Department of Commerce, Bureau of the Census, *County Business Patterns 1967: United States* (Washington, D.C.: U.S. Government Printing Office, June 1968).
3. U.S. Department of Commerce, Bureau of the Census, *Census of Manufactures 1967* (Washington, D.C.: U.S. Government Printing Office, 1970); and U.S. Department of Commerce, Bureau of the Census, *Census of Manufactures 1987* (Washington, D.C.: U.S. Government Printing Office, 1992).
4. Growth rates calculated and compared using *Census of Manufactures* productivity data for periods from 1947 to 1967 and from 1967 to 1987.
5. *Census of Manufactures 1967 and 1987*.
6. *County Business Patterns 1990*.
7. *County Business Patterns 1967 and 1990*.
8. *County Business Patterns 1990*.
9. *Census of Manufactures 1967 and 1987*.
10. Growth rates calculated and compared using *Census of Manufactures* productivity data for periods from 1947 to 1967 and from 1967 to 1987.
11. *Census of Manufactures 1967 and 1987*.

Acknowledgements

Our commission was, by design, an experimental engagement between practitioners and policy leaders from the industrial modernization and training communities. The endeavor would not have been possible without the extraordinary contribution of my co-chair Matt Coffey, President of the National Tooling and Machining Association. Under Matt's leadership, NTMA has demonstrated what well supported foundation firms can achieve in skills development.

We commend our fellow commissioners for the intellectual energy and ecumenical spirit they brought to our dialogue. They came to the table in a time of political transition and achieved the common vision, principles, and program advocated in this report.

Our work together would have been far less fruitful and enjoyable without the facilitation of Brian Bosworth. As a commissioner, and as our consultant, Brian gave us crisp meetings, careful summaries, and early drafts of the report. His persistence helped us define the principles that frame the program we recommend. His patience and pen were appreciated by all.

Phil Nanzetta of NIST extended the horizon of the industrial modernization mission with a presentation of the Manufacturing Extension Partnership plan at the initial commission meeting.

Evelyn Ganzglass and John Lederer of the National Governors Association provided expert counsel on the contribution of states, accounts of recent state-level innovations, and rigorous readings of several drafts.

At key stages in the evolution of our perspective we drew on the expertise of Bill Ruxton of the National Tooling and Machining Association, Erin Flynn of Jobs for the Future, and Rich McGahey, then of the Senate Labor Committee and now Director of the Joint Economic Committee of Congress.

Our report was improved by astute comments from Phyllis Eisen of the National Association of Manufacturers; Bill Kolberg of the National Alliance of Business; Dan Luria of the Industrial Technology Institute; Mike McMillan, Dan Marschall, and Bob Baugh of the Human Resource Development Institute of the AFL-CIO; Mary McCain of the American Society for Training and Development; and Leo Reddy of the National Coalition for Advanced Manufacturing.

Matt Kane of the Modernization Forum brought his extensive experience in training policy to commission discussions and a journalist's passion for precision to our report. Deb Hoffman of the Forum produced our meetings, added clarity to our text, and designed our report.

The principles, policies, and program advocated in this report are the collective wisdom of the Modernization Forum Skills Commission. Any deficiencies of conception or expression are the sole responsibility of the president of the Modernization Forum.

Jack Russell
Dearborn, Michigan
August 1993

The Modernization Forum

The Modernization Forum serves the NIST Manufacturing Technology Centers (MTCs) and the growing community of organizations that support industrial modernization. The mission of the Modernization Forum is to enhance the technical capabilities, knowledge, resources, and cooperative action of organizations that strengthen America's smaller manufacturers.

The Manufacturing Technology Centers and their federal sponsor, the National Institute of Standards and Technology (NIST), established the Modernization Forum in 1992 as a means for cooperation among MTCs and MTC-wide communication with organizations that share the goal of modern manufacturing in the United States. The priorities of the Modernization Forum are to:

- Build an infrastructure for collaborative learning among the MTCs
- Facilitate development of MTC capabilities
- Enhance cooperation between the MTCs and other organizations
- Broadly communicate the MTC mission of industrial modernization

For more information on the work of the Modernization Forum, please contact:

Jack Russell, President

Debra Bailey Hoffman, Manager of Member Services and Operations

Matt Kane, Manager of Program Analysis and Development

20501 Ford Road
Dearborn, MI 48128
Phone: (313) 271-2790
Fax: (313) 271-2791