Critical Issues in the Evolving Relationship Between Business, Industry, and Postsecondary Education

A Report on Research Funded by a Technology Reinvestment Project Grant to the National Coalition of Advanced Technology Centers from the National Institute of Standards and Technology

Ann-Claire Anderson

and Debra Kosarek

Volume 1, Number 4, of the National Coalition of Advanced Technology Centers Report Series

April 1997
Ann-Claire Anderson is a research associate for the Technology Reinvestment Project at the Center for Occupational Research and Development.

Debra Kosarek is the Coordinator of Continuous Quality Improvement for the Bill Priest Institute for Economic Development.

Printed in the United States of America

ISBN 1-57837-031-0
# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Summary</td>
<td>v</td>
</tr>
<tr>
<td>Rationale</td>
<td>1</td>
</tr>
<tr>
<td>Regional Procedures and Results</td>
<td>4</td>
</tr>
<tr>
<td>Bill Priest Institute for Economic Development, Dallas</td>
<td>4</td>
</tr>
<tr>
<td>County Community College District, Dallas, Texas</td>
<td></td>
</tr>
<tr>
<td>Center for Applied Competitive Technologies, De Anza</td>
<td>6</td>
</tr>
<tr>
<td>Community College, Cupertino, California</td>
<td></td>
</tr>
<tr>
<td>Center for Applied Competitive Technologies, Fullerton</td>
<td>8</td>
</tr>
<tr>
<td>Community College, Anaheim, California</td>
<td></td>
</tr>
<tr>
<td>Itawamba Community College, Tupelo, Mississippi</td>
<td>10</td>
</tr>
<tr>
<td>New Technology Center, Ivy Tech State College, Terre Haute, Indiana</td>
<td>12</td>
</tr>
<tr>
<td>Center for Contemporary Technology, Moraine Valley</td>
<td>13</td>
</tr>
<tr>
<td>Community College, Palos Hills, Illinois</td>
<td></td>
</tr>
<tr>
<td>Rock Valley College Technology Center, Rock Valley</td>
<td>14</td>
</tr>
<tr>
<td>College, Rockford, Illinois</td>
<td></td>
</tr>
<tr>
<td>Western Massachusetts Center for Business and Technology</td>
<td>16</td>
</tr>
<tr>
<td>Development, Springfield Technical Community College, Springfield, Massachusetts</td>
<td></td>
</tr>
<tr>
<td>National Trends and Implications</td>
<td>17</td>
</tr>
<tr>
<td>How People Learned About the Community Colleges and ATCs</td>
<td>17</td>
</tr>
<tr>
<td>College Services and Products People Are Using</td>
<td>18</td>
</tr>
<tr>
<td>Critically Needed Skills</td>
<td>19</td>
</tr>
<tr>
<td>Internet and Technology Used</td>
<td>20</td>
</tr>
<tr>
<td>Desired Changes or Increases</td>
<td>21</td>
</tr>
<tr>
<td>Skill Standards</td>
<td>22</td>
</tr>
<tr>
<td>Recommendations</td>
<td>22</td>
</tr>
<tr>
<td>Specialized Technical Training</td>
<td>22</td>
</tr>
<tr>
<td>Computer-Related Training</td>
<td>23</td>
</tr>
</tbody>
</table>
Job Recruitment, Placement, and Mentoring .............................................................. 23
Partnership and Communication with Industry ....................................................... 23
Education Reforms ................................................................................................. 24
Conclusions ............................................................................................................ 24
Critical Issues in the Evolving Relationship
Between Business, Industry, and
Postsecondary Education

Executive Summary

The Business, Industry, and Education study was initiated to gather information from business and industry on critical issues concerning the relationships between technological advances, technology education, workforce training, and economic development. Using Technology Reinvestment Project (TRP) funds, the National Coalition of Advanced Technology Centers (NCATC) sponsored a series of regional forums addressing those critical issues at member institutions. Administered by the Center for Occupational Research and Development, NCATC is a consortium of advanced technology centers (ATC) established by two-year postsecondary institutions across the country to help industry and its workforce keep pace with changes in technology. Eight NCATC members took part in the TRP Business, Industry, and Education (BIE) forums. Each participating member received a subgrant of up to $20,000 with a requirement of 150 percent in-kind match or cash. In February 1997 the National Institute of Standards and Technology (NIST) was given a comprehensive report on the BIE project—including the survey instruments used by the subgrantees. Critical Issues in the Evolving Relationship Between Business, Industry, and Postsecondary Education is a summary of that document.

Participating ATCs were chosen by location and by their expressed desire to explore the relationship between business, industry, and postsecondary education institutions. It was assumed that data gathered from institutions representing a broad cross section of the country would reflect nationwide trends.

Key outcomes expected from the forums were

- Identification of issues affecting industry-based education as reflected through small and medium businesses and their relationships with ATCs,
- Recommendations to industry and educators based on the findings of the forums, and
- Assistance to colleges and businesses in implementing the recommendations.

The primary problems identified were

- Lack of awareness of the services and programs offered by community colleges and ATCs,
- Lack of availability of products and services that are needed from the community colleges and ATCs,
Changes in the relationship between business and the community colleges, and
Lack of information on and the need for distance learning techniques and technologies.

For educators to serve business and industry adequately, business and industry must be
aware of the services provided by the colleges. When participants in the BIE forums were
asked how they had learned about the products and services offered by the local colleges,
the top three responses were personal contact, word of mouth, and direct mail. Personal
contacts and referrals were critical means of communicating information about the
colleges.

The critical needs identified by business and industry representatives included the
following:
- Basic skills, including English as a second language, and workforce literacy skills,
  including mathematics
- Planning, decision-making, critical-thinking, and problem-solving skills
- Interpersonal communication skills, sensitivity to workforce diversity, and cultural
  awareness
- Ethics, management and leadership skills, and quality tools and techniques
- Hands-on training and technical skills in specific demand occupations and industries
- Computer training, including Internet training

Participants believed that if companies and the workforce are to be ready for the future,
there must be more collaboration between business, industry, and education. Participants
also believed that, to achieve more than regional success, all of these critical needs and
issues must be addressed in a consistent manner across the nation. Among the changes
companies desired was improved communication from the colleges and ATCs about
available services and products. While some regional reports concluded that local
industry *was* knowledgeable about the availability of products and services, this was not
the national trend.

Recommendations from business and industry included the following:
- More technical assistance and technical degrees
- Programs for producing multiskilled technicians and management
- Total quality management training and assistance programs, including internationally
  recognized standards documentation for quality management (ISO 9000) and
  environmental management (ISO 14000)
- More computer courses and software training using up-to-date technology
• Consolidation of training, assessment, and job placement into regional or local one-stop career centers
• Improved communication about available services and products
• Increased college and ATC interaction with industry, including faculty and industry expert exchange programs
• Frequent industry curriculum review
• College/ATC partnerships with industry to maintain current equipment and technology
• Dissemination of more information on skill standards
• Incorporation of basic literacy, mathematics, and communication skills into all courses
• Increased educational funding and personnel to better serve the needs of industry
• Increased flexibility of class schedules and locations
• More customized on-site training
• Further streamlined registration and increased articulation between education/training institutions
• Assistance in bringing about greater awareness and understanding of features, benefits, and availability of current technologies, including Internet and other distance learning mechanisms
Critical Issues in the Evolving Relationship
Between Business, Industry, and
Postsecondary Education

Rationale

The purposes of this report are to recount the findings of the Business, Industry, and Education (BIE) forums held across the United States, in the hope that these findings can be put to use by advanced technology centers (ATC), Manufacturing Extension Partnerships (MEPs)*, and educational institutions nationwide; and to describe briefly different ways a BIE forum may be organized, since other community colleges may benefit from inviting local industry to discuss critical issues concerning technology, education, and economic development.

Using Technology Reinvestment Project (TRP) funds, the National Coalition of Advanced Technology Centers (NCATC) sponsored a series of regional forums at member institutions. NCATC is a consortium of ATCs established by two-year postsecondary institutions across the country to help industry and its workforce keep pace with ongoing changes in technology. Of the eighty-nine NCATC members, eight participated in the BIE forums, for which each participating member received a subgrant of up to $20,000 with a requirement of 150 percent in-kind match or cash.

NCATC is administered by the Center for Occupational Research and Development (CORD), a nonprofit educational organization. TRP is a project funded by the United States Department of Commerce through the National Institute of Standards and Technology (NIST). In April 1994, NCATC received a TRP grant, the objectives of which were to

- Improve and increase collaboration and communication capabilities among NCATC members,
- Increase ATC access to sources of expertise and support,
- Supplement existing in-house ATC expertise,
- Ensure that ATC staffs remain abreast of new technological developments and applications,
- Enhance ATC performance, and
- Enable others to replicate appropriate strategies and practices.

* Manufacturing Extension Partnerships are a NIST-funded network of organizations supporting increased competitiveness of U.S. manufacturers.
Under this grant, NCATC’s proposal focused on four related areas: on-line resources, benchmarking, professional development, and curriculum development. In fulfillment of part of the grant, the BIE forums were designed to bring ATCs together with regional industry, labor, government, and educators to examine issues critical to the survival and growth of business and industry. Specific and unique needs of small and medium industry were explored. Gaps between the workforce needs of business and industry and the ability of the current educational system to meet those needs were discussed. Creative ways ATCs may be instrumental in filling the educational needs of business and industry clients were a major focus of the forums. The BIE forums were conducted to examine workforce development, relationships between degree and nondegree programs, and models for the delivery of training and retraining programs.

Key outcomes expected were

- Identification of issues affecting industry-based education as reflected through small and medium businesses and their relationships with ATCs,
- Recommendations to industry and educators based on the findings of the forums, and
- Strategies for business and education to use when implementing the recommendations.

A subgrant agreement between NCATC and the participating ATCs required the development of forums to address issues in the following critical areas:

- Needs assessments for technology in small manufacturers located in the local geographic service region
- Manufacturing skills assessments
- Electronic network infrastructure equipment and technology issues and information
- Efficient mechanisms for delivery of technology-transfer information (distance learning, on-site delivery of training and expertise)
- Efficient delivery of customized training and retraining programs
- Service relationships between ATCs and manufacturing firms

One criterion that guided the selection of participating ATCs was location. It was assumed that data gathered from institutions representing a broad cross section of the country would reflect nationwide trends. In addition, the participating sites were chosen for their demonstrated competence in the field of technology education. All of the selected sites have excellent track records for staying abreast of, and in some cases anticipating, changes in cutting-edge technology.
The participating sites were the following:

- Bill J. Priest Institute, Dallas County Community College District, Dallas, Texas
- Center for Applied Competitive Technologies, De Anza Community College, Cupertino, California
- Center for Applied Competitive Technologies, Fullerton Community College, Anaheim, California
- Itawamba Community College, Tupelo, Mississippi
- New Technology Center, Ivy Tech State College, Terre Haute, Indiana
- Center for Contemporary Technology, Moraine Valley Community College, Palos Hills, Illinois
- Rock Valley College Technical Center, Rock Valley College, Rockford, Illinois
- Western Massachusetts Center for Business and Technology Development, Springfield Technical Community College, Springfield, Massachusetts

The participating ATCs devised a list of questions to be answered by the forums. The forums were organized in a number of ways. Some ATCs used surveys as a data-gathering method, while others used roundtable discussions and focus groups. The methodology used by each ATC is more fully described in the following section of this report. There were many differences between the forums, but all began with the focal point of identifying problems that needed to be addressed.

The primary problems identified were

- Lack of awareness of the services and programs available through local community colleges and ATCs,
- Lack of products and services needed by business and industry,
- Changes in the relationship between business and the community colleges, and
- Lack of information on and the need for distance learning techniques and technologies.

By the conclusion of the project, almost 1400 people had contributed either statistical or anecdotal information. Most of the statistical information in this report was acquired through survey instruments and interviews. Additional, anecdotal information was gleaned from roundtable discussions, focus groups, comments on surveys, and interviews.
Regional Procedures and Results

Bill Priest Institute for Economic Development, Dallas County Community College District, Dallas, Texas

The Bill J. Priest Institute for Economic Development was created in 1989 as a combined effort of the Dallas County Community College District and the private business sector to support economic development in Dallas County. The institute was founded on the belief that the ability to leverage expertise and contacts of strategic partners greatly increases efficiency and expertise and expands or broadens perspectives. Two strategic partners who work with the institute on an ongoing basis and who chose to participate with the institute in the BIE project are the Consortium for Supplier Training and the Texas Manufacturing Assistance Center. Both of these partners work predominantly with small manufacturing businesses and frequently serve the same clients. Additionally, many of the clients are served jointly by one or both of the partners in conjunction with the staff of the Bill Priest Institute.

The rationale behind the Bill Priest Institute approach to the project was to build on similar research being done by the University of North Texas, but narrow the focus to the point of recommending specific products, services, and facilities to address industry needs. In August 1995, the University of North Texas Survey Research Center sent a survey to 1,219 small manufacturing companies that were defense industry subcontractors. The survey sent to these companies was developed by the Survey Research Center, representatives of five small companies, and the Fort Worth Office of Economic Adjustment. Of the 1,219 companies in the database, 100 responded to the survey. The data from the survey were compiled into a report released in October 1995. Of the 100 surveys included in the report, 80 percent employed forty-nine employees or fewer. The results of these surveys provided a foundation for the BIE research team at the Bill Priest Institute to build upon when further examining the needs of small companies.

![Figure 1](Dallas, Texas)
Figure 1 illustrates the findings of the survey administered by the University of North Texas—findings that are relevant to the BIE study because they look at the needs of small and medium manufacturers. (These findings were then validated by focus group forums sponsored by the Bill Priest Institute.) Fifty-nine percent of 100 respondents reported that productivity is a problem in their industries; 49 percent said that quality of trade skill employees is a problem; and 31 percent said they needed help with adapting new technologies, teaching basic skills, training for ISO 9000 certification and administration, and assistance in establishing clients to which they can export goods. In addition to the needs charted, participants indicated a need for trade skills training, manufacturing production assistance, and help in robotics technology. Of the 85 percent who were aware of colleges and universities as a business resource, 46 percent had used the colleges and universities. Of those using colleges and universities as a resource, 97 percent gave them a positive beneficial rating.

Since an emphasis of the BIE project is change and change management, the Institute determined to establish a customer satisfaction baseline at the beginning of the project. To gather data, two focus groups were held with suppliers to the Consortium for Supplier Training. The Consortium for Supplier Training is a group of leading quality-focused companies that comes together to provide world-class training in quality improvement. The member companies of this consortium include Bayer Corporation, Chrysler Corporation, Eastman Kodak Company, Motorola, Texas Instruments, and Xerox Corporation. The twelve associate member organizations include companies such as Texaco, Inc., Westinghouse, and Price Waterhouse. These focus group discussions were held in August 1995 and specifically focused on the product, service, and technology needs of these companies as they related to the Bill Priest Institute. All of the companies in attendance were manufacturers with fewer than 500 employees. By focusing the discussion on the needs and issues facing small to medium manufacturing companies, the Institute was able to establish a baseline, and also gather data for the Business, Industry, and Education project. In addition to input from the focus groups, research guidelines were established by the grant project. Because this customer satisfaction benchmark had been established, it was easier to measure institutional effectiveness and improvement in meeting customer needs.

The Texas Manufacturers Assistance Center (TMAC) provides a Dallas-Fort Worth center as part of a national grant from NIST. TMAC’s primary responsibility under NIST funding is to provide direct support to small and intermediate manufacturing companies. The TMAC focus groups brought together representatives from twelve small manufacturing companies in four industries. These industries were measuring and controlling devices, medical instruments and supplies, motor vehicles and equipment, and aircraft and parts. The focus groups asked participating companies about internal and
external barriers to competitiveness and productivity. These discussions provided insight into the products and services the companies need.

The survey instrument developed by the Bill Priest Institute was administered by mail, telephone, and fax. The list of companies contacted consisted of current clients that fit the company profile, as well as companies selected from a Dun & Bradstreet database. From a database of more than 400 companies, thirty-three companies had responded by the response deadline of April 15, 1996.

The Bill Priest Institute breakfast meeting of April 10, 1996, was convened as an opportunity to validate the findings of the earlier surveys, interviews, and focus groups. This meeting also furnished an opportunity to provide a forum for others not included in earlier group discussions to contribute.

The results from the Bill Priest Institute survey and follow-up focus groups indicated that business and industry faced the following workforce development and productivity issues:
  • Workforce literacy, including communication skills and English as a second language
  • Workforce diversity
  • Computer and other technical skills
  • Work ethics and professional behavior
  • Resistance to change
  • Business and college collaboration
  • Problem-solving and decision-making skills
  • Quality control
  • Marketing issues, including import and export
  • Employee turnover
  • Cycle time reduction
  • ISO 9000 training and certification
  • Teamwork skills

**Center for Applied Competitive Technologies, De Anza Community College, Cupertino, California**

Located in the heart of the Silicon Valley in Cupertino, California, the Center for Applied Competitive Technologies (CACT) at De Anza College supports small and medium manufacturers (fewer than 500 employees) in building and maintaining a skilled and productive workforce by offering training and technology transfer services. CACT offers customized and affordable on-site training; business assessments; half-day and full-day
seminars; and special events for partnering, networking, and collaborative problem solving. Manufacturing companies may receive training in statistical process control (SPC), total quality management, cycle time reduction, design for manufacturability, continuous process improvement, and introductions to the Internet, among other subjects.

On March 22, 1996, CACT hosted a forum called “Doing Business in a Global Environment” at De Anza College’s Hinson Campus Center. The event was attended by fifty people representing industry, trade associations, government and economic development agencies, educational institutions, and the media. The forum was cosponsored by several San Francisco Bay Area entities including Stanford University; Joint Venture: Silicon Valley Network; CityNet—City of Cupertino; the California Trade and Commerce Agency; the Bay Area Regional Technology Alliance; and the Northern California Manufacturing Extension Center.

Two major topic areas—“global competitiveness” and “technology strategies”—were discussed by panels from industry and education. Industry panelists represented LAM Research, Pacific Bell, Galgon Industries, Inc., Acuson, Storage Dimensions, Hewlett-Packard, IBM, and CyberLogix.

The De Anza College forum was designed to allow participants to provide input through discussion. The consensus among participants was as follows:

- Small to medium manufacturing companies are not fully aware of services offered at community colleges and ATCs.
- Skilled labor in general is a critical need.
- Students should be introduced to manufacturing in high school.
- Students need “hands-on” courses and career path options.
- Curricula should be designed specific to industry.
- At an early age, students should learn about the importance of manufacturing.
- Training should be customized and flexible to reduce the time employees are away from production activities.

Participants expressed interest in current technologies, such as

- The Internet, and
- Electronic data interchange (EDI), which is now required for government contracts.

Participants agreed that large companies are aware of the need to support the vitality of smaller companies as links in their supply chain and that small companies must be willing to take risks and open new markets. Participants noted that networking and partnering help reduce risk taking for the smaller companies and agreed that management principles
adopted in the past decade, such as the integration of cross-functional teams, are required for success.

Center for Applied Competitive Technologies, Fullerton Community College, Anaheim, California

The Fullerton College Center for Applied Competitive Technologies (CACT/FC) participated in the development of a BIE forum designed to identify the issues affecting ATCs and determine how those issues affect the industry-based education needs of small and midsize manufacturing and technology-based businesses.

To bring a forum of business leaders together in the Los Angeles basin, a strong partnership of public and private organizations had to be developed. The greater Los Angeles area is served by three centers for applied competitive technology (CACT). Fullerton College joined with El Camino and Glendale Colleges to multiply resources and industrial contacts. Business Continuity Resources (BCR), a private, minority-owned entrepreneurial organization involved in electronic networking, was chosen to lead the effort to bring collaborative research to the BIE forum.

In addition to its direct efforts to build a collaborative BIE forum, Fullerton College was preparing to participate in a county-wide effort to survey Southern California businesses on their needs and expectations of how community colleges can serve them. Two distinct thrusts were thus developed, one to establish the formation of an ongoing collaborative public-private organization to assist small and midsize manufacturing industries to better use the resources of the community colleges, and a second that would survey Orange County business on a formal set of questions aimed at understanding businesses’ need for education and services that could be delivered by community colleges.

BCR identified over seventy-five critical lifeline industries that would be invited to a discussion group to address issues of vital importance to the manufacturing and technology industry sectors. Due to a loss of nearly 35 percent of all jobs in manufacturing in the last eight years in Southern California, the ability of small and midsize manufacturers to compete in new technologies and businesses was seen as a matter of survival.

The initial subgrant was used as seed money to fund a long-term commitment to finding solutions to problems facing the survival of manufacturing in Southern California. Fullerton College helped establish a group called the Southern California Technical Forum (SCTF), whose primary objective was to promote the survival of manufacturing and increase the ability of small shops to reach scarce resources through collaboration. At the first meeting of the SCTF, a leadership roundtable was convened. The goal was to get
a cross section of manufacturing businesses together with representatives from education and the public sector to decide what issues relevant to manufacturing survival should be brought to the discussion. Twenty-three individuals representing twenty organizations responded to the request to join the leadership group of the SCTF. First, a half-day session using interactive computer software to aid in decision making was used. Nineteen portable laptop computers were linked via client-server network, and input was made by all attendees directly to a database. Through facilitated discussion, the group defined nine critical areas on which to base further discussions.

The conclusion of the first leadership forum was that the process should be continued but that future forums should be narrowed along industry clusters. It was agreed that the first industry cluster would be the primary metals, fabrication, metal working, and industrial machining industries. This cluster was chosen due to an existing emphasis by Rebuild Los Angeles (RLA), a nonprofit group that had had success in forming other industrial sector associations and was trying to gain collaboration in the metals industry sector in the Los Angeles region.

A partnership was formed between SCTF and RLA to approach metal working companies and seek their input in building a linkage between industry and education. RLA supplied a mailing list of 350 manufacturers in the region. These companies became the primary target for the CACT metal working forum. After receipt of over forty positive responses, the metal working forum was held April 26, 1996.

The first industry forum was composed of metal working industry executives and service support providers. The forums were held without charge to participants, thus allowing interested parties and small companies to attend free. Lunch was served as another incentive for attendance.

To gain specific insight into what industries need for training, Fullerton College administered a short questionnaire to supplement the data gathered from roundtable discussions.
Figure 2 shows the survey results compiled from the Fullerton College data. Thirty-four percent of the respondents felt that employees needed a higher level of computer literacy; 27 percent wanted assistance in keeping up with the most recent developments in manufacturing technology; 26 percent felt that employees needed better basic skills (mathematics and reading, for example); 24 percent believed that greater attention to customer service was needed; 23 percent felt that training in the ISO procedures was warranted; 22 percent felt that leadership skills and total quality management techniques should be taught; and 20 percent wanted training in the methods and benefits of computer networking.

During one forum, participants indicated the following as critical workforce development issues, in order of priority:

- Team building/group empowerment
- Problem solving/critical thinking
- Technical skills
- Quality/statistical process control/ISO-9000
- Supervisory/leadership skills
- Interpersonal communication

**Itawamba Community College, Tupelo, Mississippi**

Itawamba Community College was responsible for planning the BIE forum for the state of Mississippi. To ensure statewide participation in the forum, ICC invited the State Board for Community and Junior Colleges’ Center for Quality and Productivity to be a cosponsor. This, in conjunction with the Mississippi Skill/Tech One-Stop Career Center System, formed the partnership that served as the vehicle for planning, organizing, and
conducting the BIE forum. More than 6,000 invitations were sent to business, industry, and education entities.

The BIE forum was conducted on February 28 and 29, 1996, in Jackson, Mississippi. Attendance at the forum exceeded expectations with more than 200 registrations. Several national and state leaders made presentations to foster thinking about forum topics. On Thursday, February 29, all participants at the luncheon meeting were asked to complete BIE forum questionnaires that would document opinions about many workforce development issues.

![Figure 3](image.png)

Figure 3 illustrates the training and job profiling needs expressed by the ninety participants who completed Itawamba’s BIE forum questionnaire. Sixty-two percent of the respondents wanted more preemployment (prehire) training available; 58 percent expressed a need for computer-aided training; 54 percent wanted custom-designed training specific to their companies; 49 percent wanted training to be held on-site at the plant or business; and 38 percent indicated a need for job profiling. In addition, more than 35 percent of the participants indicated the need for internships. Thirty percent cited a need for certificate and A.A.S. degree programs, with 28 percent desiring distance learning. Although survey respondents did not overwhelmingly indicate a need for quality and ISO 9000 training, it was cited as a need.

While 60 percent indicated they are not using the Internet, 63 percent indicated a desire to use it in the future. More than 72 percent believed they would benefit from Internet training and/or services provided by local community colleges and ATCs. More than 55 percent believed national skill standards and curricula would provide an adequately prepared workforce.
New Technology Center, Ivy Tech State College, Terre Haute, Indiana

Ivy Tech State College, Terre Haute, Indiana, organized an Assessment of Technology for Industrial Modernization, conducted throughout the state of Indiana. The purpose was to identify issues affecting industry-based education as reflected through small and medium businesses and their relationships with advanced technology centers (ATCs). Within the statewide structure of Ivy Tech State College, each of thirteen regions has established an ATC that provides assistance to business and industry. Each ATC is staffed with a minimum of one professional staff member. These members are the partners who planned and conducted the assessment.

Sixteen questions were asked of each forum attendee. Some questions pertained to company information for categorization purposes, such as type of business, product, and number of employees. Other questions included level of education required, new work skills required, and major issues affecting business for the next five years and beyond. The assessment was conducted in ten areas of the state: Columbus, Evansville, Gary, Kokomo, Lafayette, Madison, Muncie, Richmond, Sellersburg, and Terre Haute.

There were 321 businesses participating in the assessment. Of the 234 survey respondents, 75 percent represented manufacturing and 73 percent employed fewer than 500 people. The industries represented include plastics, metals, pharmaceuticals, electric and gas utilities, wholesale distribution, and automotive parts.

<table>
<thead>
<tr>
<th></th>
<th>Based on 234 responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Appl.</td>
<td>76%</td>
</tr>
<tr>
<td>Teamwork</td>
<td>71%</td>
</tr>
<tr>
<td>Quality Standards &amp; Concepts</td>
<td>65%</td>
</tr>
</tbody>
</table>

Figure 4 illustrates the primary needs of industry in Indiana as identified by the assessment participants: 76 percent of the respondents wanted more computer
applications classes made available, 71 percent requested more training on teamwork, and 65 percent perceived a need for more instruction on quality standards and concepts.

In addition to the data charted above, 81 percent of the participants identified workforce development as the most critical issue facing their business or industry. Of the participating businesses, 43 percent required high school diplomas of their employees and 52 percent required associate degrees. New-product development was identified by 57 percent of the participants as a critical issue.

Center for Contemporary Technology, Moraine Valley Community College, Palos Hills, Illinois

The Center for Contemporary Technology, Moraine Valley Community College, Palos Hills, Illinois, serves a region that includes 326 square miles in southwestern suburban Chicago. The Moraine Valley BIE forum audience included small and medium business and industry managers and decision makers from a mixture of service and manufacturing businesses. The participation of 140 business and industry representatives was achieved through a mailing survey, while fifty others attended a business forum breakfast meeting. To reach the intended audience, a one-page, two-sided survey was mailed to business persons in the region. Included with the survey was a letter describing the survey’s intent. One hundred forty responses were received from a survey mailing of 5,300.

A second mailing and a press release were used to advertise a breakfast meeting and roundtable format both to obtain the same input sought with the survey and to allow participants to discuss responses with other members of the business community. Over 5,000 invitations were mailed. The breakfast format was selected because it has been found that business managers prefer to attend such events prior to beginning their work day. The morning forum included a buffet breakfast; a main speaker and organized discussion tables centered on the main issues of the survey. The mailed survey and the breakfast forum centered on the same questions.

The mailed survey results were tabulated from the actual responses noted, while the results of the breakfast forum were interpreted from discussion and consensus reached at the various tables. In the analysis, the responses of those who participated through the mailed survey and those who participated through the breakfast forum are combined.
Figure 5 indicates the responses of 192 participants in the Moraine Valley project when queried about their industries’ needs. Seventy percent perceived a need for customized training; 62 percent felt that training on the use of the Internet was needed; 50 percent wanted help with assessment of employees. In addition to the feedback represented by the chart, 70 percent indicated they had not received training via remote transmission. Yet, 79 percent of these same participants indicated they are planning to use the Internet. It is important to note that those planning to use the Internet may not currently be using the Internet and other technologies. Participants believed students entering the workforce must display a “work ethic” and care about the organization. There was a perception that students are being discouraged from entering jobs that have a “getting one’s hands dirty” image. More experience on the job was given as another critical need for students.

Rock Valley College Technology Center, Rock Valley College, Rockford, Illinois

Rock Valley College Technology Center in Rockford, Illinois, recently completed a business needs assessment program to align its programming with regional requirements. A direct-mail questionnaire was sent to a group of 340 regional firms, and a summary of the information collected was compiled. Both small and larger companies from a broad range of industrial sectors were represented. Forty businesses completed and returned the questionnaires. A breakfast forum was held after the questionnaires were returned. The forum was initiated to facilitate networking among the respondents as well as elicit more feedback and elaborate on responses to selected questions. Participants were asked to comment on the issues related to changes in workforce development and technology transfer methods. Dr. Robert Weinstein of Bradley University opened the meeting as guest speaker. Weinstein stressed the importance of local business participation in the
assessment process. Immediately following the presentation, focus groups were formed consisting of six to eight people. The smaller group meetings were invaluable in gaining insight into the participants’ actual needs. Participant responses were generally representative of the needs of the community as a whole. Excellent suggestions were offered as to how the college can work with business leaders to address those needs. A key issue was a lack of basic skills and a lack of willingness to work among the workforce population. Quality, assessment skills, and industrial technical skills were listed among the most beneficial training programs. Benchmarking was also indicated to be a valuable tool in today’s rapidly changing technical environment.

Figure 6  Rockford, Illinois

Figure 6 indicates needs expressed in the information compiled from the survey responses gathered by Rock Valley Technical Center. Thirty percent of the respondents saw a need for increased skill training, job placement assistance, and better communication from advanced technology centers. In addition, 76 percent preferred customized training rather than “off-the-shelf” training packages. More than 50 percent indicated they used needs assessments to identify skill requirements and training needs. More than 85 percent of the respondents have used services and products at the college, with customized training and short seminars representing the largest part of that collaboration. When describing some of the skills training needed, participants indicated the following:

- Machining
- CNC
- Blueprint
- AC/DC motor theory
- Demand flow technology
- Transitioning from 2D to 3D solid modeling
Western Massachusetts Center for Business and Technology Development, Springfield Technical Community College, Springfield, Massachusetts

A BIE conference was hosted by Springfield Technical Community College in Springfield, Massachusetts, on April 11, 1996. Approximately 150 people attended, representing faculty and administrators from high schools, two-year and four-year colleges, and universities, as well as business and industry representatives from throughout New England and New York.

The conference focused on the technological trends and the critical workforce training issues of two industries predominant in Western Massachusetts: telecommunication and advanced manufacturing. The conference was designed to allow maximum flexibility of attendees to ensure a respectable turnout. The telecommunication session was held in the morning and the advanced manufacturing session in the afternoon. A luncheon was included that featured a guest speaker, a local patent attorney who spoke about intellectual property law in the global marketplace as applied to the telecommunication and manufacturing industries. Vendors from both industries were invited to display their products to provide the participants with an opportunity to sample the latest technology and to network.

The format for the morning and afternoon sessions was the same: a one-hour and fifteen minute industry panel discussion followed by five one-hour and fifteen minute concurrent breakout sessions on the various industries represented. Keynote speakers included the president of STCC, the mayor of the city of Springfield, and two prominent representatives from the telecommunication and advanced manufacturing industries. Each breakout session facilitator was asked to prepare a written summary of the session discussion, from which data were gathered.
Figure 7 illustrates the skills needed by employees, as expressed by participants in the Springfield Technical Community College breakout sessions. Sixty-nine percent indicated that employees need to be computer literate, 59 percent need employees with critical thinking skills, 54 percent need advanced technical skills from their employees, 53 percent need employees with good communication skill, and 44 percent of the respondents need employees with excellent interpersonal skills. In addition, 37 percent believed employees need computational skills such as basic math. More than 26 percent indicated a need for business skills such as business writing, marketing, and customer service. Management skills, including basic supervision, TQM, time management, and conflict resolution, are needed according to more than 23 percent of the respondents. More than 34 percent responded that personal skills, including responsibility, self-esteem, integrity, and honesty, are needed. An understanding of world geography, diverse cultures, and people is needed according to more than 29 percent. More than 22 percent wanted ISO 9000 and language training for their workforce.

National Trends and Implications

How People Learned About the Community Colleges and ATCs

For community colleges and ATCs to advertise their products and services to business and industry, they first need to identify the means by which they are already reaching that market. When people were asked how they had learned about the products and services of the local colleges, the top three responses were personal contact, word of mouth, and direct mail. Personal contacts and referrals were a critical means of communicating information about the colleges. Some of these references came from professional groups
and associations. Direct mail was also cited as an effective means of communication. These direct mail communications included college catalogs and course schedules; brochures; and invitations to previews, conferences, and meetings. Other media such as newspaper articles and radio and television advertising resulted in limited success in communicating products and services available through the colleges. Business and industry representatives gained more benefit from being directly contacted by college representatives, learning from colleagues about college offerings, or receiving material specifically addressing opportunities.

**College Services and Products People Are Using**

Community colleges and ATCs already meet a variety of business and industry’s educational needs. The BIE forums, as a matter of measuring where the colleges and ATCs stand as service-providers, investigated what services and products the businesses and industries use. Businesses specifically are using the following from the colleges:

- Credit or noncredit courses, including courses such as accounting and finance
- Technical training, customized training, and apprenticeships
- English as a second language and basic skills training
- Quality, including ISO 9000, statistical process control, and benchmarking
- Dislocated worker training and job placement
- Computer and other technology training
- Network and satellite services
- Books, videos, and other materials
- Training facilities
- Business development services, including government procurement
- Employee assessment
- Environmental health and safety

Businesses are using local colleges to provide a wide spectrum of education services and products. Company employees attend both credit and noncredit courses in areas such as accounting, basic skills training, mathematics, and English as a second language, and participate in technical programs and apprenticeships. Computer and other technology training is being delivered in a customized format on the companies’ premises as well as on campuses using standardized curricula. Courses and materials in quality improvement, competitiveness, and environmental issues are areas in which companies are relying on colleges and advanced technology centers for assistance. Employee recruiting and assessment are being performed in conjunction with college outplacement, testing, and contract training departments. When companies lack adequate facilities to conduct training and educational sessions, they have used available space on the school campus.
At times, this contracting for space has included computer labs and network and satellite services. To provide economic development, the schools often provided these small and medium companies with assistance in government contract procurement.

**Critically Needed Skills**

Businesses were virtually unanimous in their desire for a workforce with a solid foundation in what traditionally has been called a basic or core education. This core of basic skills was considered mandatory and the point from which other, higher level training should commence. These basic skills included the following:

- English as a second language and workforce literacy, including mathematics
- Planning and decision making
- Critical thinking skills and problem solving
- Sensitivity to diverse cultures in the workplace and the ability to successfully interact with different cultures
- Critical thinking skills allowing individuals to link and synthesize information
- Interpersonal skills and communication skills

This educational foundation will prepare workers to participate in training and education on more advanced concepts and complex tasks. Advanced training and education will enable workers to maintain their employability in an ever-changing global business market. Some of the critical areas of knowledge and ability are these:

- Management, supervision, and leadership skills
- Total quality management, including ISO 9000, statistical process control, and design for manufacturability
- Teamwork, virtual teams, and group empowerment
- Hands-on training and technical skills in specific-demand occupations and industries
- Computer training, including Internet training

Having a workforce prepared in these areas will enable these companies to be competitive in a global marketplace. These skills will enable workers to develop innovative products and services, and will provide economic development and strength to their regions of the country. To accomplish this task, participants believe there must be more collaboration between business, industry, and education. Each person touched by these decisions and impacted by education and the economy is a stakeholder. These stakeholders bring critical knowledge and a unique perspective to current issues. In addition, participants stated that training must be performed on state-of-the-art tools with up-to-date curricula. For companies and industries not employing current and/or state-of-the-art technologies, the colleges must be prepared to assist in acquiring new technologies. This assistance might
be in the form of providing information, helping to acquire grant funding, or development and research. Respondents felt all of these critical needs and issues must be addressed across the nation in a consistent, but not federally overseen, manner to achieve more than regional success.

![Bar Chart](Image)

**Figure 8 Critical Needs of Business and Industry**

In the entire BIE study, almost fourteen hundred participants provided their insight and comments. Some of the input was anecdotal; Figure 8 reflects the 893 responses that were quantifiable. This combination allows a more complete picture to be visualized regarding the needs and opinions of business and industry and opportunities for a closer collaboration between business and education. Figure 8 indicates that 70 percent of the business and industry participants in the BIE study felt a critical need for better soft skills—critical thinking, communication, customer service, leadership, and teamwork—from their employees; 51 percent need their employees to be more computer literate; 34 percent need instruction in quality management; and 20 percent need advanced technical training for their employees.

**Internet and Technology Used**

Companies are using computer-based training and computer and language labs as a means of training delivery. Satellite seminars and services and television or video transmission are providing distance learning. Internet training and Internet-delivered courses are also being used by the companies participating in this study. While some of these companies are receiving courseware and services from satellite transmission or via the Internet, most are not. Many of the companies were unsure how to make use of these current satellite and computer network technologies or unsure of the feasibility. Many companies expressed an interest in learning more or felt they might be able to use these methods of delivery in the future. Convenience was a factor to the companies, as was cost. Interest was expressed in reducing the time workers must be away from work or the distance they must travel to receive training and education.
**Desired Changes or Increases**

Improved communication about services and products and better interaction with industry were frequently cited as changes that must take place. While some regional reports concluded that local industry was knowledgeable about the availability of products and services, this was not the case nationally. Many companies indicated a need for more specific information about products and services available to them from colleges and advanced technology centers. The consensus was that all would benefit from a closer working relationship and cooperation between business and education. When participants were asked if additional funding and personnel should be allocated to increase business services, the response was affirmative. Small and medium companies wanted more technical assistance, including help instituting business strategies such as agile manufacturing, procuring government contracts, understanding environmental regulations and patent laws, and navigating international trade markets.

Companies wanted more technical degrees and training than the current offerings. Some technical degrees and training specified were the following:

- Accounting
- Drafting
- Machining and computer numeric control
- Fabrication techniques and blueprint reading
- Construction trades
- AC/DC motor theory and applications
- Demand flow technology
- Transition from 2D to 3D solid modeling

This training must be done with state-of-the-art technology by highly qualified trainers or faculty who have relevant work experience. Students need to learn on equipment the industry is currently using. This training should be delivered at the company site if necessary, on a flexible schedule. Curricula should be frequently updated, with faculty and industry experts working closely together to keep the educational and training experience relevant. Student apprenticeships and mentoring were seen as ways to assist students with transitioning from school to work. To further assist both business and students, the companies want one-stop career centers, job fairs, further assistance with recruiting and placement, and a streamlined registration process.

The response was widespread, indicating a need for an increased emphasis on basic literacy, mathematics, and science. The companies also stressed the need for excellent communication skills and the ability to work on a team, using technology. Computer knowledge and training were viewed as necessary tools for virtually every industry, not a
luxury with limited workplace application. The ability to work in a diverse environment with others from different cultures and heritages was viewed as something in which many workers needed more training. Companies want students to receive more training in quality improvement tools and techniques. Training must be developed that spans the entire organization, from the worker on the shop floor to senior management. Special pricing for groups of employees to attend classes and low-cost loans or grants to help fund training were seen as ways to assist small and medium companies.

**Skill Standards**

Based on the national results of this study, one area in need of clarification became evident. When asked about national skill standards, many respondents did not understand them and thus were not supportive of the concept. Based on their comments, the participants, while wanting consistency in training and other products and services across the country, are also leery of any certification or standardization system that appears to be mandated by the federal government. It became clear that the companies prefer the training they receive to be customized to their needs. Many participants want a clearer understanding of the different certification and training processes and what standards they represent because they fear that national skill standards mean government intervention in their business and industry.

**Recommendations**

Industry-wide training must be consistent for there not to be disparity between different regions in the country. Thus, while business and industry are apprehensive about skill standards administered by the federal government, more information must be disseminated on the potential benefits of using skill standards to establish industry-wide consistency in skills and knowledge competency. For there to be clarification and consistency, more work must be done in the area of linking work and education in realistic and feasible ways. One way to do this is to continue the project currently underway at CORD, the Integrated System for Workforce Education Curricula (ISWEC). The primary goal of the ISWEC project is to integrate academic and vocational education in a curriculum framework for grades nine through fourteen. From a base of standardized curricula and standards, customization can be based on specific company and regional needs.

**Specialized Technical Training**

Community colleges and ATCs should provide more technical assistance and technical training, as companies want more technical degrees and certificate programs. Some of the technical training would include areas such as machining, computer numeric control (CNC), blueprint reading, AC/DC motor theory and applications, demand flow
technology, transition from 2D to 3D solid modeling, programs for multiskilled technicians and management, total quality management, ISO 9000, ISO 14000, shop floor and technical training, and management training.

**Computer-Related Training**

More computer courses should be offered in a flexible-schedule format. These computer courses could be offered either for college credit or as continuing education courses. Software training at all levels of the organization, from shop floor to management level, should be offered in the same flexible format. Participants might choose to participate in a continuing education certification program. Colleges and ATCs need to foster greater awareness and understanding of the features, benefits, and availability of current technologies, including the Internet and other distance learning mechanisms.

**Job Recruitment, Placement, and Mentoring**

Consolidation of assessment, training, and placement into a one-stop career center was requested by many study participants. Job fairs and recruiting, placement, and mentoring programs are methods of assisting both companies and students with transitioning not only from school to work but from one industry to another. As the workforce copes with the changes required by the global marketplace, such programs will help both the company and the student successfully match the person to the industry, company, and job.

**Partnership and Communication with Industry**

For a successful collaboration between industry and education, there must be improved communication about available services and products. Based on data gathered in the study, the most successful way to improve communication is to establish relationships between companies and community colleges and ATCs. Part of the increased interaction with industry should include exchanging faculty with industry experts. Faculty should periodically spend a semester working in a company and bringing that knowledge back to the classroom. Industry experts could similarly spend a semester at the college, providing expertise for curriculum development or training. At the same time, there must be frequent curriculum review and revision incorporating more input from industry. Through partnerships established with industry to maintain current equipment and technology, students would learn on the equipment and use the technology they would realistically expect to use on the job.

Community colleges and ATCs need to provide industry with more information on low-cost loans and grants to help small and medium companies fund training. Further streamlining registration and increasing articulation between educational institutions would make the educational system more adaptable and less confusing to students and companies.
Education Reforms

In addition to the recommendations previously cited, education must incorporate basic literacy, mathematics, and communication skills into all courses, whether they are for college credit or not. Curricula must be competency based using an integrated approach to the competency development. There must be an increase in educational funding and personnel to serve the needs of industry as were outlined in this study. Colleges must offer more flexible, customized, on-site training and class schedules.

Conclusions

Business and industry are poised and eager to work with educational institutions, to better train the workforce, and to keep industry competitive. Business, industry, and education have an opportunity to move into a more complementary relationship in the future. Global competition requires a skilled workforce capable of learning, growing, and innovating. Through collaboration, the workforce, American business and industry, and education can remain vital and competitive.