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# **Midwest Regional Business Requirements for Educational Services in Information Technology A New Look**

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**August 2009**





**The Midwest Center for Information Technology** is a virtual entity – a partnership of the AIM Institute and ten community colleges in the four-state region of Iowa, Nebraska, North Dakota and South Dakota working in collaboration with K–12 school districts, four-year colleges and universities and employers to strengthen and expand the region's information technology workforce.

The formation of the Midwest Center for Information Technology was provided by the National Science Foundation under Grant No. DUE-0101715.

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# INTRODUCTION

In 1995, 1999 and 2002, AIM Institute completed major studies of Greater Omaha Business Requirements for Educational Services in Information Technology. These studies were well received by both the business and academic communities as presenting an accurate representation of Greater Omaha and Midwest business requirements for Information Technology (IT) education.

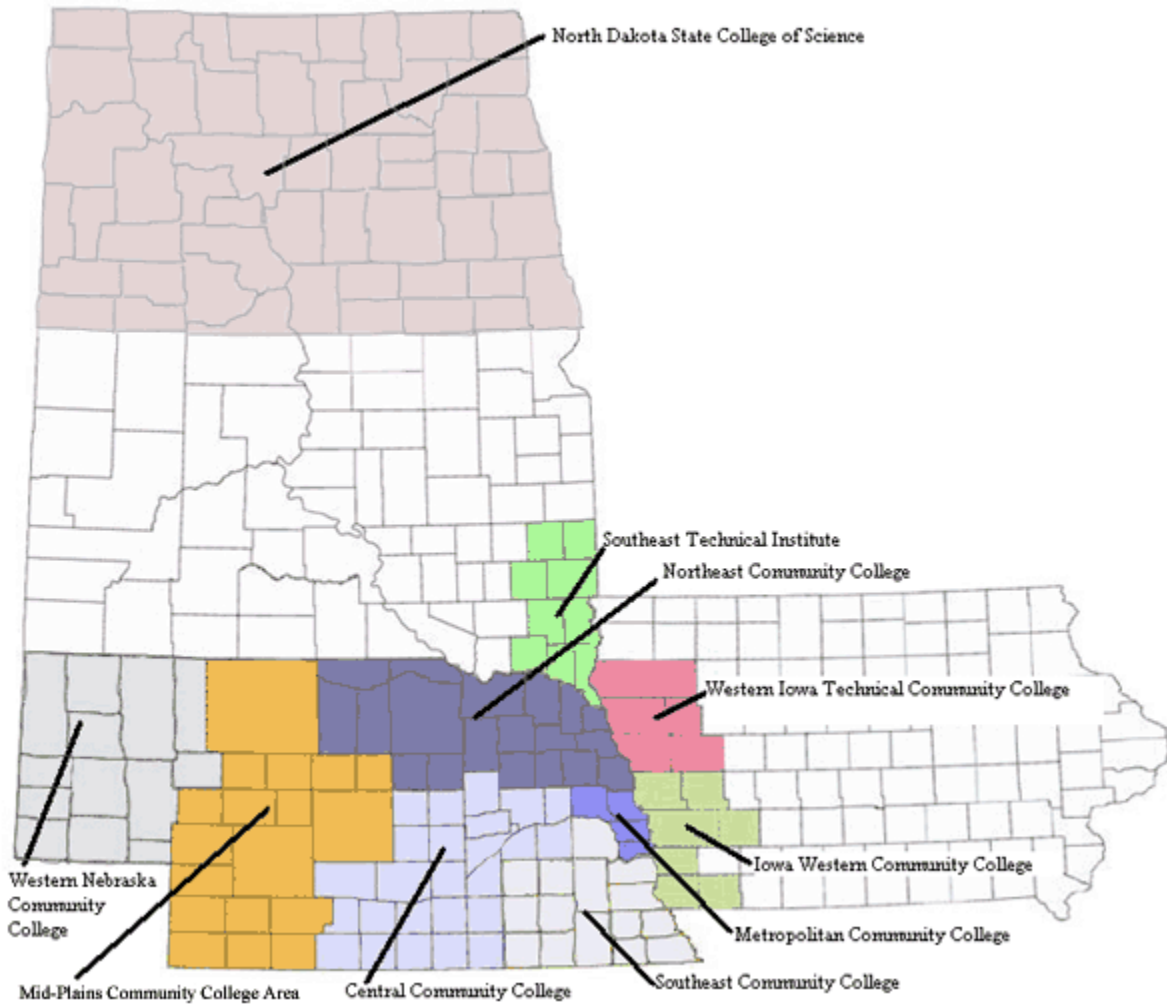
The studies documented areas of greatest demand by the business community for IT educational services and noted areas where the academic community could strengthen its offerings. The studies also estimated the size of corporate educational budgets and Information Technology employment. The titles and results of these studies are listed below and are available at AIM Institute, 1905 Harney Street, Omaha, NE 68102 or on the AIM Institute website at [www.aiminstitute.org](http://www.aiminstitute.org).

- 1) Greater Omaha Business Requirements for Educational Services in Information Technology (1995)
- 2) A Vision for Information Technology and Engineering Education (1995)
- 3) Greater Omaha Business Requirements for Educational Services in Information Technology – Update for 1999
- 4) Progress and Change in Information Technology (1999)
- 5) Midwest Regional Business Requirements for Educational Services in Technology (2002)

In 2008, in partnership with ten Midwest community colleges (Appendix A), AIM Institute conducted a similar Midwest Regional Study for employers in Nebraska and parts of Iowa, South Dakota and North Dakota. Each of the ten partnering community colleges circulated a questionnaire to businesses in their service area (Figure 1). There were a total of 49 respondents, of which 64% were outside the Omaha Metropolitan Area. These results provided insight into Business Requirements for Educational Services in Information Technology by firms in both metropolitan and non-major metropolitan areas in these four states. The findings will be instructive to community colleges and postsecondary institutions as they evaluate and develop Information Technology curriculums. The findings will also be helpful in student recruiting, faculty selection and training, community outreach programs, and structuring articulation agreements between IT programs at area colleges and universities.

Finally, even though the economic climate over the last 15 years has been volatile (the dot-com bubble, the subsequent dot-com bust, the housing bubble and the housing bust, and the economic recession of late 2008 and 2009), there has been steady growth in the demand for IT professionals by all types and location of employers. There has also been a change in the desired attributes and skills of IT employees that firms seek to hire from each college graduating class.

**FIGURE I: Midwest Center for Information Technology  
Four-state Region: North Dakota, South Dakota, Nebraska and Iowa**



# EXECUTIVE SUMMARY

## A. Employment Trends

A survey to document business requirements for Midwest firms was completed in partnership with the Midwest Center for Information Technology. The study included 49 firms in the Midwest with a total of 33,748 employees. Information Technology employees totaled 3,996, or 11.8% of all employees in responding firms. Other significant numbers include:

- 16.8%, or 5,680 of all employees from responding firms, are currently taking academic courses.
- 23 firms reported having tuition reimbursement programs.
- Total training budgets for the 26 firms reporting these data was nearly \$9.5 million and is projected to approach \$10.3 million in five years.
- For the firms reporting these data, the per-employee training budget is:

Training Budget – Per Employee		
	2008	Five Years
All Employees	\$396	\$398
IT Employees	\$247	\$241

The percentage of employees with sub-baccalaureate degrees was 39.3%. Many firms would like to see their employees gain more advanced degrees.

These employees create a large potential market for future academic courses and degree programs, and they create a higher demand for better articulation agreements to facilitate advanced educational opportunities.

Degree Level of IT Employees		
	2008	Five Years
Sub-baccalaureate	39.3%	27.7%
Baccalaureate	45.4%	51.9%
Graduate	15.3%	20.4%

Firms ranked the importance of 9 Academic Disciplines and 48 Applied Areas within those Academic Disciplines.

The following section shows the top ranked Applied Areas within each Academic Discipline.

## B. Academic Disciplines and Most Important Applied Areas

### Electronic Engineering

#### Telecommunications

- Protocols, ATM, TCP/IP, Frame Relay, ADSL
- Wireless
- Telephony

#### Systems Integration

- Software/Hardware Configuration
- LAN/WAN
- Installation/Implementation
- Quality Assurance

#### Computer Engineering & Systems

- Operating Systems/Compilers/Tools

#### Systems Development & Business Integration

- Methodology
- Data Warehousing
- Client/Server
- Business Planning/Re-Engineering
- Design/Programming

#### Technology Management

- Project Management
- Business Planning/Strategies/Tactics
- Specific Technical Competencies

#### Technical Marketing

#### E-commerce

- Security

### Networking (LAN/WAN/IP)

- Protocols - Open & Proprietary
- Integration
- Convergence
- Servers, Bridges, Routers and Hubs
- Security, Encryption, Firewalls
- Continuity, Interruption & Recovery

### Other significant findings include:

- Expenditures for training and education will increase faster (8.4%) than employment (6.0%).
- The largest components of training budgets are External Seminars and Workshops (24.2%), Vendor Certification (28.6%) and College Tuition (27.6%). These three areas are also expected to be the major source of education expenditures in the next five years.
- IT professional positions will grow (11.5%) slightly faster than all employees (9.2%).
- The Academic Disciplines and Applied Areas ranked most important demonstrate the dramatic move to the Network / E-commerce / Telecommunications environment that businesses find themselves in today. Those changes create a demand for the associated areas of security, development, interruption and recovery and management issues.

## C. Recommendations

### Business/Academic Partnerships

Business has the opportunity to directly influence academic programs by:

- Creating partnerships between business and academia for joint appointments of highly qualified individuals to bring top quality talent to their firm and their collegiate partner.
- Further defining specific needs in the Academic Disciplines and Applied Areas listed as most important in this study. This work should be done in close consultation between the business and the academic community.
- Working with colleges and universities to develop creative programs that attract more students into all Information Technology programs. The objective is to better map the attributes of new graduates to the demand for IT professionals from employers.
- Continuing educational opportunities for IT professionals, particularly in rural areas, is essential for continued growth of firms and the region. Community colleges have the opportunity, charter and responsibility to help meet this need.

### Education of the IT Professional

Continued focus on the IT career pipeline is essential. Educational requirements for IT employees will continue through their career. Articulation agreements that allow seamless progression to higher degrees are essential. Other barriers to further education associated with distance such as incomplete offerings at a site, obsolete offerings, poor articulation, etc., must be diminished to meet future workforce requirements.

### Faculty

The array of topics required in the future may exceed the ability of any educational institution to deliver. An adequately prepared faculty and relevant curricula will require:

- Robust faculty training opportunities.
- Strategies to attract experienced full-time and adjunct faculty.

- The ability to add and drop class offerings more rapidly.
- Increased academic partnerships and curriculum/faculty sharing across the academic community.

### Shifting Demand

The Academic Disciplines of Telecommunications, Networking and E-commerce will be the major technology drivers in the near future. Of the 23 highest ranked Applied Areas, 10 fell within these Academic Disciplines. Focus by postsecondary institutions on courses and programs in these areas will be key to maintaining growth and relevancy in the academic programs.

### The Platform of IT

Anyone with an extended career in IT will recall an earlier time when the platform was a mainframe, security was a locked door and a halon system, backup was tape stored off site in a salt mine, and telecommunications was largely a telephone switch under building management.

The result of the convergence of computer and communications technologies has been profound. There has been no event in the history of business and commerce that has so quickly and dramatically changed business and social perspectives. Today the Academic Disciplines of Telecommunications, E-commerce and Networking now comprise the platform for virtually all business, commerce and social interaction. These Academic Disciplines are among the fastest growing segment of IT employment. And, as a business community and culture, we are just at the start of this new era.

The business and management of this emerging world also is placing new and expanded requirements and responsibilities on the IT professional. Growing requirements of IT management include Business Planning/Re-engineering; Project Management; Security; Continuity, Interruption and Recovery; and Quality Assurance.



Finally, the systems and applications that run on these new platforms are requiring skill sets that are changing as rapidly as the technologies change.

For the college and university, the challenge to educate job ready students will be constant and ongoing. More effective interdisciplinary efforts across different colleges, departments and programs within a single institution will have high yields.

These emerging platforms and technologies are the most interdisciplinary yet. They include

compute technologies, telecommunications, networking, audio, video, graphics, law, business writing, both computer and human languages, public policy, marketing, finance, etc.

The IT department will become increasingly important to the strategic success of the enterprise. The college and university that best understands today's and tomorrow's technologies and strategies will best prepare their students for tomorrow's world of work.

# BACKGROUND

## A. Study Methodology

This study is based on a questionnaire designed to document Midwestern firms' present and future requirements for employment, training and curriculum. The questionnaire is very similar to previous surveys completed in 1995, 1999 and 2002 by Greater Omaha and Midwestern employers.

The results likely understate the number of IT professionals because most employers report only their computer center employees as IT professionals. This reporting may not include IT professionals doing sales, training, marketing, working on the factory floor or other departmental IT professionals. The results also understate training budgets. Only 26 of the 49 survey respondents provided these data and many stated their reported training budgets were incomplete.

Respondents were asked to rank specific academic Disciplines, Applied Areas, technology Areas and Vendor Certifications. In addition,

they were asked to rank how well area universities were meeting their needs in each Applied Area. Values shown in this report are averages based upon:

$$\frac{\Sigma \text{ Ranked Responses for Each Applied Area}}{\Sigma \text{ Respondents That Ranked Each Applied Area}}$$

Ranking scale: 1 = Most Important; 4 = Least Important, with a midpoint value on such scale = 2.50

Survey responses were received from 49 employers with a total of 33,748 employees. Respondents included 30 employers with employment of 100 or more, and 17 small firms with fewer than 100 employees. Two respondents did not report total employment. Appendix B includes the list of respondents. Appendix C shows the composite averages and totals for each question.

# FINDINGS

## A. Employment and Training Budgets

### Corporate Employment

Survey forms were completed by 49 firms including 30 with Midwest employment of 100 or more, and 17 small firms with employment less than 100. Two respondents did not report the number of their Midwest employees.

Survey results represent firms with 33,748 employees.

During the next five years employment is expected to approach 35,776, a 6.0% growth.

An estimated 5,680 or 16.8% of present employees are currently taking academic courses for credit.

Twenty-three firms reported having tuition reimbursement programs.

Firms believed that over 5,240 additional employees should be taking academic credit courses.

### Corporate Training Budgets

Twenty-six of the respondents reported their training budgets. The total training budgets for the firms reporting these data were \$9,476,000 or \$396 per employee.

These training budgets are projected to increase slightly to over \$10,274,500 in five years, or \$398 per employee.

For firms providing detail training budget expenditures, 14.4% of the budget is used for internally-provided training with the balance going to external seminars and workshops (24.2%), vendor certification programs (28.6%), college tuition (27.6%), and other (4.3%).

In five years, internal training budgets are projected to be unchanged at 14.4% of the total training budget, while external seminars and workshops is essentially unchanged at 24.1%. Certifications are also essentially unchanged at

28.7%, tuition for college courses increase slightly to 27.9%, and other drops 4.0%.

### Small Firms

While there were 17 firms with less than 100 employees, only 11 firms reported training budgets. These training budgets per employee for the 11 small firms reporting this data are below their larger counterparts at \$264. Total employment for the firms with less than 100 employees is expected to grow 31.1% while training budgets grow 30.4%. Therefore, the average training budget, per employee, will remain essentially unchanged at \$263 over the next five years.

### IT Employment – All Firms

IT employment for all reporting firms totaled 3,996. IT employees account for 11.8% of all employees. Two firms did not report the number of IT employees. In addition, two firms reported zero IT employees currently but each projected one IT employee in five years.

The five-year growth in the number of IT employees at all firms is projected at 4,752 or an increase of 18.9% compared to a growth of 6.0% for all employees.

13.0% of all IT employees are taking academic credit courses. This is slightly more than the rate of 11.9% for all employees.

16.3% of these IT employees were on college tuition reimbursement programs.

### IT Training Budgets – All Firms

A total of 24 respondents reported to have IT training budgets. The total IT training budget for these 24 employers was over \$987,000 or an average of \$247 per person. In five years these employers expected their training budgets will increase to \$1,145,700 or \$241 per IT employee.

**Small Firms – IT**

IT employees account for 15.7% of all employees in the smaller firms compared to 11.8% for large firms. Small firms project IT employment in five years will approach 20% of total employment.

Total IT training budgets for 10 of the 17 small firms reporting these data were \$38,500. Five-

year IT training budgets are projected at over \$59,500, an increase of 54.3%.

For the small firms reporting the data, IT training averaged \$642 per employee and is projected to decrease to \$595 in five years.

## B. Academic Disciplines

Respondents were asked to rank specific Academic Disciplines. They were also asked to report the number of IT employees in each discipline and project their requirements five years hence. Finally, respondents were asked to estimate what percent of their IT workforce had educational background at the sub-baccalaureate, baccalaureate or graduate level.

In this survey the following nine academic disciplines were ranked:

- Electronic Engineering
- Telecommunications
- Systems Integration
- Computer Engineering and Systems
- Systems Development and Business Integration
- Technology Management
- Technology Marketing
- E-commerce
- Networking (LAN/WAN/IP)

Many of these disciplines will appear in college catalogs across the nation. Some, however, reflect changing business needs that have not yet found their way into academic programs.

### Electronic Engineering

In colleges and universities across the country, the intellectual roots for IT curriculums are frequently in three colleges: Engineering, Business Administration, Liberal Arts (often the Math Department).

In the Midwest, most programs have a strong business or liberal arts heritage. The survey results rank many technical disciplines which may not be available in each community. *Electronic Engineering* accounted for less than 1.0% of respondents' IT employees. Employers ranked Electronic Engineering as the least important Academic Discipline.

Electronic Engineering		
Rank	3.22	% Employees
		0.9%
Rank 1 = Most Important 4 = Least Important		

### Telecommunications

The *Telecommunications* discipline included protocols, wireless, telephony, fiber optics and other areas. Networking, discussed below, focuses on LAN, WAN, Internet Protocols, Integration, Server Security, etc.

Much of the Midwest business community has access to a functional and growing telecommunications infrastructure. Some local industries with global markets face challenges of a lack of adequate telecommunications and the associated intellectual infrastructure to capitalize on strong long-term market potential. Compared to earlier studies, the respondents ranked this discipline lower – as the third least important academic discipline. This may suggest that, compared to a similar 2002 study by AIM Institute, the telecommunications industry has improved telecommunications infrastructure sufficiently so that most employers now have adequate access.

Total employment is expected to grow to slightly to 2.46% of the IT professionals in five years.

Telecommunications		
Rank	2.30	% Employees
		1.7%
Rank 1 = Most Important 4 = Least Important		

### Systems Integration

The much-discussed convergence of IT disciplines such as computers, video, telecommunications, wireless, TV, performing arts, web, graphics and textual presentation, etc., is well documented. Building and supporting the networked platform used by most firms to conduct business requires significant *System Integration* skills. In addition, the integration of electronic devices into structures, machines, and processes is accelerating.

The integration of converging technologies takes place at the physical and application levels:

- 1) The hardware platforms including the integration into physical structures and devices.

- 2) Applications frequently transcend all levels of activity within and across the firm plus providing access to its suppliers and customers.

The survey's definition of Systems Integration captures the essence of that integration stated above. This activity consumes increasing amounts of corporate energy. Concepts are taught in various courses. Increasing momentum towards interdisciplinary curriculums at postsecondary institutions would encourage greater Systems Integration focus.

At 1.81, Systems Integration was the second highest ranked Academic Discipline.

Systems Integration		
<b>Rank</b>	<b>1.81</b>	% Employees
		12.4%
Rank 1 = Most Important 4 = Least Important		

### Computer Engineering and Systems

The importance of *Computer Engineering and Systems* areas ranked in the middle of all Academic Disciplines. Historically, many topics in this discipline have had a mainframe focus. Slightly over 19% of the IT professionals were reported working in this discipline.

Computer Engineering and Systems		
<b>Rank</b>	<b>2.22</b>	% Employees
		19.0%
Rank 1 = Most Important 4 = Least Important		

### Systems Development and Business Integration

Applications that transcend all levels of business activity within a firm or industry are captured in the Academic Discipline of *Systems Development and Business Integration*. Historically, many of the area colleges and universities have had relatively strong courses and programs around systems and development topics. These programs are increasingly addressing broader issues associated with the changing platforms and business requirements and their impact on systems development.

At a score of 1.83 Systems Development and Business Integration ranked third among all academic disciplines.

Systems Development and Business Integration		
<b>Rank</b>	<b>1.83</b>	% Employees
		28.9%
Rank 1 = Most Important 4 = Least Important		

### Technology Management

*Technology Management* ranked fourth overall as an academic discipline. One dimension of Technology Management is Project Management. As documented in this and earlier studies, Project Management ranks near the top of the list of educational services desired by Midwest employers.

Technology Management		
<b>Rank</b>	<b>1.85</b>	% Employees
		9.0%
Rank 1 = Most Important 4 = Least Important		

Technology Management accounted for 9.0% of all IT employment, and will decline slightly to 7.8% in five years as a percentage of the IT workforce.

### Technical Marketing

*Technical Marketing* professionals accounted for 1.5% of IT employment. Few, if any, academic programs that focus on Technical Marketing exist in the area. The focus of a Technical Marketing discipline would include the technological knowledge and understanding of how to market technology-based products and services.

Technical Marketing		
<b>Rank</b>	<b>3.13</b>	% Employees
		1.5%
Rank 1 = Most Important 4 = Least Important		

### E-commerce

E-commerce has "exploded" onto the business and technology landscapes. E-commerce represents an entirely new discipline and skill set in IT. It also will affect public policy, the relevance of geography, law, marketing and numerous other business and policy issues.

In this study, E-commerce is presented as an Academic Discipline with five Applied Areas. It scored as the seventh most important Academic Discipline with 6.7 % of the IT workforce. In five years, firms projected that over 9.0% of the IT professionals will work in E-commerce.

E-commerce		
Rank	2.26	% Employees
		6.7%
Rank 1 = Most Important 4 = Least Important		

### Networking

Networking was the highest ranked (1.61) Academic Discipline. In the analysis that follows, five different Applied Areas, or nearly one-third of all highly ranked Applied Areas, came from Networking. Nearly every firm with multiple computers and an Internet strategy requires these skills. Networking is one of the fastest growing IT disciplines for large and small firms alike.

Networking		
Rank	1.61	% Employees
		6.9%
Rank 1 = Most Important 4 = Least Important		

In the last decade a dramatic change has occurred in business and industry. The explosion of the World Wide Web and communication technologies is leading to a restructuring of the business enterprise. This table clearly documents that impact of the "wired world" on IT employment in Midwestern firms.

### Other

There were 12 respondents to this survey that recorded *Other* Academic Disciplines that were important to their firms. The topics listed

included PC Technology, Security, Oracle DBA, People Factor, Technology Infrastructure, and Mainframe. A total employment in these disciplines was 815, however, there was one large employer that recorded 800 employees currently employed in the mainframe environment with a projected decline to 600 in five years. Total Other employment was projected to be 637 in five years.

Other		
Rank	n/a	% Employees
		13.5%
Rank 1 = Most Important 4 = Least Important		

### Degree Levels

For all firms, the current number of IT professionals with a sub-baccalaureate degree is 39.3%, and is projected to decline to 27.7% in five years. These data suggest firms expect employees to make a logical progression in academic achievement while on the job. It also suggests these employers will be looking for more new employees with baccalaureate degrees.

The data also implies the need for good articulation agreements between two- and four-year institutions to facilitate these career development requirements. It also argues for good web-based distance educational opportunities for employees whose work is not near a college campus.

Percent of IT Employees by Educational Status		
	Current	Five Years
Sub-baccalaureate	39.3%	27.7%
Baccalaureate	45.4%	51.9%
Graduate	15.3%	20.4%

Employees with sub-baccalaureate degrees make a large potential market for additional academic courses/degree programs. Numerically, these employees are highly concentrated in larger firms that frequently have college tuition reimbursement programs.

### C. Applied Areas and Needs Met by Area Colleges and Universities

Respondents were asked to rank specific *Applied Areas* within each Academic Discipline. In addition, they were asked to rank how well area colleges and universities were meeting their needs in each *Applied Area*. Appendix C shows ranking for all 48 *Applied Areas* for all 49 firms.

The average score for all *Applied Areas* was 2.32. Meanwhile, the average score for needs met by area colleges and universities was 2.41. This average difference of 0.09 indicates colleges and universities were not viewed as meeting needs as effectively as the firms would like (the higher the value or importance of the *Applied Area*, the less needs were met by the colleges).

Average Rank of All Applied Areas (48)			
	Importance to Your Firm*	Needs Met by Area Colleges and Universities**	Average Difference
All Firms	2.32	2.41	0.09
*Rank 1 = Most Important 4 = Least Important			
**Rank 1 = Meets Needs 4 = Does Not Meet Needs			

There were 18 *Applied Areas* in which all employers considered their needs were being met by area colleges and universities. Compared to similar previous studies completed by the AIM Institute, this is the highest number of *Applied Areas* in which the employers considered the colleges and universities having curriculum for students that meet their needs as

employers. However, colleges and universities were not considered to be meeting the needs for any of the 23 highest ranked *Applied Areas* (those with scores between 1.0 and the average ranking of 2.32).

As in past studies, the greatest gap between firms' needs and college and university performance occurred in *Applied Areas* ranked most important by the firms. For example, TABLE I shows that 11 of the 23 *Applied Areas* ranked as most important had an average difference between firm rank and needs met by area colleges and universities near or exceeding 0.50. The important *Applied Areas* are:

- Telephony
- Software/Hardware Configuration
- LAN/WAN
- Project Management
- Security
- Protocols
- Integration
- Unification, Convergence
- Servers, Bridges, Routers and Hubs
- Security Encryption, Firewalls
- Continuity, Interruption & Recovery

Of the remaining high ranked *Applied Areas*, the gap between the employers' needs and their evaluation of colleges' meeting of those needs were above the average gap of 0.09. These results suggest the *Academic Areas* most important to firms are the Academic Areas where local colleges and universities are less successful in meeting these firms' needs.

**TABLE I: Applied Areas Ranked Between 1.0 and 2.32  
Compared to Needs Met by Colleges and Universities – All Firms**

Academic Discipline Applied Area	*Rank of Discipline	*Rank of Applied Area	**Needs Met by Colleges and Universities	Avg. Difference
<b>Electronic Engineering</b>	<b>3.22</b>			
<b>Telecommunications</b>	<b>2.30</b>			
– Protocols, ATM, TCP / IP / Frm. Relay, ADSL		2.00	2.16	0.16
– Wireless		2.02	2.32	0.30
– Telephony		2.02	2.48	0.46
<b>Systems Integration</b>	<b>1.81</b>			
– Software / Hardware Config.		1.53	2.02	0.49
– LAN/WAN		1.62	2.07	0.45
– Installation/Implementation		1.91	2.07	0.16
– Quality Assurance		2.11	2.45	0.34
<b>Computer Engineering and Systems</b>	<b>2.22</b>			
– Operating Systems / Compilers / Tools		2.17	2.27	0.10
<b>Systems Development and Business Integration</b>	<b>1.83</b>			
– Methodology		2.13	2.41	0.28
– Data Warehousing		2.22	2.48	0.26
– Client/Server		1.67	1.98	0.30
– Business Planning / Re-Engineering		2.30	2.43	0.13
– Design/Programming		2.18	2.25	0.07
<b>Technology Management</b>	<b>1.85</b>			
– Project Management		1.71	2.44	0.73
– Business Planning Strategies / Tactics		2.12	2.44	0.32
– Specific Technical Competencies		2.08	2.31	0.23
<b>Technical Marketing</b>	<b>3.13</b>			
<b>E-commerce</b>	<b>2.26</b>			
– Security		1.87	2.47	0.60
<b>Networking (LAN/WAN/IP)</b>	<b>1.61</b>			
– Protocols – Open and Proprietary		1.83	2.31	0.48
– Integration		1.74	2.45	0.71
– Convergence		1.87	2.55	0.68
– Servers, Bridges, Routers and Hubs		1.51	2.17	0.66
– Security, Encryption and Firewalls		1.43	2.31	0.88
– Continuity, Interruption and Recovery		1.63	2.48	0.85
*Rank 1 = Most Important 4 = Least Important				
**Rank 1 = Meets Needs 4 = Does Not Meet Needs				

### Highest Ranked Applied Areas

The highest ranked Applied Area was *Security, Encryption and Firewalls*. *Continuity, Interruption and Recovery* was ranked as the fifth highest ranked Applied Area. This suggests a very large number of number 1 rankings and an area of very high concern among employers.

There were 10 of the 23 top scoring Applied Areas in the Networking / E-commerce / Telecommunications areas documenting the relevance of these disciplines in the “wired world” of today’s Midwest firms.

TABLE I documents 23 Applied Areas that were scored between 1.00 and the average score of 2.32 by all firms. A review of these Applied Areas suggests four major groupings that are important to business:

- Client / Server, Networked Platform and related technology, Communication Protocols, and the applications that will run on that platform.
- Business Planning / Re-engineering, Project Management, Technical Management and Quality Assurance

associated with Security; plus the Continuity, Interruption and Recovery required for the designated maintenance of these hardware and application environments.

- Data Warehousing, Methodologies, Design/Programming associated with expanded strategic expectations from data and systems on emerging platforms.
- E-commerce Security and increased relevance of networking, documents a clear migration in corporate employment and focus.

The strength of the scoring in these Applied Areas will continue to be of great interest to area academic institutions.

While major new programs and courses are being developed or are now available – particularly Client / Server, communications, networking and E-commerce – the business need caused by rapid industry changes are outstripping the availability of desired educational services.

## D. Institutional Responsiveness

### Responsiveness by Type of Institution

Employers were asked to report how responsive different types of educational institutions were in meeting their needs. The following data suggest that the community colleges/ technical institutions are viewed as slightly more responsive than four-year colleges and universities. They were viewed as much more responsive than private trade schools.

Responsiveness by Type of Institution	
	Rank
Private Trade Schools	2.05
Community Colleges / Technical Institutions	1.63
Four-year Colleges and Universities	1.96
Rank 1 = Very Responsive 4 = Seldom Responsive	

### Preparedness of Graduates

Employers were also asked to report how prepared graduates from different types of educational institutions were upon becoming employed. The data also shows a slightly higher rank for community colleges / technical institutions.

Preparedness of Graduates	
	Rank
Private Trade Schools	2.02
Community Colleges / Technical Institutions	1.69
Four-year Colleges and Universities	1.78
Rank 1 = Very Responsive 4 = Seldom Responsive	

## E. Technology Areas

### General Comments

There is an array of information topics that transcend the various Academic Disciplines and *Applied Areas*. In some cases they are functional issues like data and languages while in other cases they are the emerging issues within information processing. These *Technology Areas* will provide focus to any of the *Academic Disciplines* and *Applied Areas*. To illustrate, E-commerce has an engineering dimension to it. It also has issues of web design, security, legal, graphics, audio, data management, systems integration, etc. It also includes technology management and technology marketing issues. It will impact future systems development and has become a very important part of the operating structure of a business enterprise.

Table II shows *Technology Areas* that were ranked by firms today and in five years.

Some of the *Technology Areas* like Data have been around for a long time. With the emerging technological platforms and the new forms of digitized content, the issues surrounding data are substantially broader than historically covered by traditional courses.

The survey results also show that virtually all of the *Technology Areas* will become even more important in five years. These data suggest that if colleges and universities limit curriculum and academic programs, they may miss future markets.

### Data, Telecommunications, Client/Server

TABLE II shows composite rankings for all firms and brings these *Technology Areas* into sharper focus. The highest-ranked cluster of *Technology Areas* was Data, Telecommunications, and Client/Server. This cluster characterizes the rapidly emerging electronic information processing platform for corporate America. It is anticipated that in five years, each of these areas will continue to be very important.

The employers also ranked E-commerce followed by Multimedia – Presentation and Multimedia – Technology as important in five years. These results suggest all future systems, commerce and services will be increasingly delivered on the electronic platform in a user friendly and visually pleasing manner.

**TABLE II: Ranking of Technology Areas  
All Firms**

Technology Area	2008	Five Years
Languages	2.52	2.33
Data	1.54	1.49
Telecommunications	1.70	1.62
Client/Server	1.76	1.60
Human Factors Engineering	2.74	2.53
Education Technologies / Learning Services	2.48	2.33
E-commerce	2.54	2.02
CAD/CAM/CAE	3.15	2.87
Object-Oriented Design	2.72	2.47
Artificial Intelligence	3.33	3.09
Multimedia–Technology	2.48	2.18
Multimedia–Presentation	2.44	2.11
Virtual Reality	3.20	2.96

Rank 1 = Most Important 4 = Least Important

## F. Vendor Certifications

*Vendor Certifications* have become an important part of the IT training plans for many corporations. As noted earlier, the 26 firms that provided detail training data are now spending 28.6% of their training budgets for *Vendor Certifications*.

Respondents were asked, “From your company’s perspective, are certifications becoming more important as a way to validate training/skills?” Twenty-five respondents answered yes to that question while 16 answered no; 6 respondents answered not sure. Two respondents failed to answer that question. Generally, the respondents believe that certifications “are more important than in the

past” but were less certain that they will “become more import in the future.” (Twenty-three respondents said yes, 13 respondents said no and 11 respondents were not sure.)

Firms were asked to rank seven different Vendor Certifications. TABLE III shows ranking for all 49 firms in the study. These data show:

- Microsoft and Cisco were the highest ranked certification programs. Microsoft was the clear "winner" with a score of 2.26, going to 2.11 in five years.
- Cisco was the second highest ranked certification, showing a very similar pattern to Microsoft.

**TABLE III: Ranking of Vendor Certifications All Firms**

Vendor Certifications	2008	Five Years
Microsoft	2.26	2.11
Novel	3.65	3.54
Lotus Notes	3.67	3.67
Cisco	2.44	2.33
Oracle	3.24	3.20
People Soft	3.59	3.56
Linux	3.04	2.76

Rank 1 = Most Important 4 = Least Important

## G. Professional Development Topics

Survey respondents were asked to respond to other special topics such as Technologies, Professional Development, Programming and Development, and Database that are frequently the subject of additional professional training and/or certification. TABLE IV below shows the top ranked disciplines in these various special topics. Note that several technical management

issues associated with the requirements of the emerging E-world are ranked high by firms. Security and Disaster Planning & Recovery also stands out as a critical management issues both today and in five years, ranking near the top in importance. A complete listing of the rank of all special topics is shown in the Appendix C.

**TABLE IV: Ranking of Professional Development Topics  
All Firms**

Professional Development Topics	2008	Five Years
WAN/LAN	1.82	1.73
TCP/IP	1.96	1.86
VPN	2.16	1.82
Wireless	2.07	1.80
Project Management (PPM)	2.26	1.96
Security (SANS/CISSP)	1.87	1.73
Disaster Planning and Recovery	2.00	1.78
SQL	2.15	2.02

Rank 1 = Most Important 4 = Least Important

# CONCLUSIONS

The Midwest Regional Business Requirements for Educational Services in Information Technology – A New Look survey included 49 Midwest firms with total employment of 33,748 employees.

IT employees totaled 3,996 or 11.8% of all employees in responding firms.

Other significant survey numbers include:

- 16.8% or 5,680 of all employees from responding firms are currently taking academic courses.
- 23 of the employers reported having tuition reimbursement programs.
- Total training budgets for the 26 firms reporting these data were nearly \$9.5 million now and projected to approach \$10.3 million in five years.

For firms reporting these data, the per employee training budget are:

Training Budget Per Employee		
	2008	Five Years
All Employees	\$396	\$398
IT Employees	\$247	\$241

With only 26 of the 49 respondents providing training budget information, the values reported will substantially understate the total training budget of the 49 survey firms.

Numerous additional conclusions are appropriate:

- 1) Expenditures for training and education will increase slightly faster than employment. (Employment up 6.0% in five years with training up nearly 7.4%.)
- 2) Tuition budgets will increase slightly from 27.6% of the total current training budget to 27.9% in five years. External seminars and workshops account for 24.2% of the current training budget and are projected at 24.1% in five years. Vendor certifications are expected to remain essentially unchanged at 28.6%

- to 28.7% of the total training budget in five years.
- 3) Training budgets for IT professional positions are very low in this study, especially when compared to similar studies previously conducted by the AIM Institute. The low estimates appear to be the result of some large IT employers that failed to report IT training budgets. The average of \$642 IT training budget for firms with less than 100 employees is more consistent with historical findings.
  - 4) Most firms reported only employees in the computer department as IT employees. This probably understates the number of IT professionals - missing professional technology sales personnel, operations and production floor specialists, training and education professionals and other departmental IT professionals.
  - 5) The strongest demand for curriculum and programs included:
    - Security
    - Continuity, Interruption & Recovery
    - Networking (LAN/WAN/IP)
    - Telecommunications
    - Client/Server
    - E-commerce
    - Systems Development & Business Integration
    - Project Management
    - Design/Programming
  - 6) A large potential market continues for non-traditional students at postsecondary institutions. This study shows that nearly 40% of all current IT professional employees have sub-baccalaureate degrees with over 60% of all IT employees having baccalaureate or graduate degrees. In five years, firms plan for over 70% of all IT employees to have baccalaureate or graduate degrees.
  - 7) These data also argue strongly for the need to remove barriers to continued educational growth and academic



achievement for employees. Good articulation agreements are essential to assure community/technical college graduates have good opportunities to gain baccalaureate and graduate degrees in the future. Other barriers to securing additional education include issues associated with distance, incomplete curriculum/ program offerings and obsolete offerings.

- 8) Market development by academic institutions would be well served if unique groups of non-traditional students could be identified and then

programs developed to target their unique needs.

- 9) Most survey responses were received prior to or early in the 2008 economic slowdown. While current employer demand for IT professionals is relatively slow, the long term demand for new IT graduates from all area colleges and universities will continue to grow in the foreseeable future as all phases of business, commerce, manufacturing, trade and general activities of society become more network centric.

# APPENDICES

## APPENDIX A: Midwest Center for Information Technology Partners



### Nebraska

AIM Institute  
Central Community College  
Metropolitan Community College  
Mid-Plains Community College Area  
Northeast Community College  
Southeast Community College  
Western Nebraska Community College

### Iowa

Iowa Western Community College  
Western Iowa Tech Community College

### North Dakota

North Dakota State College of Science

### South Dakota

Southeast Technical Institute

## APPENDIX B: Survey Participants

Absolute Power & Communications  
Americom  
AMGL CPA  
Anderson & Shaw Construction  
Bellevue University  
Business Management Software  
Central States Indemnity  
Chadron Community Hospital  
City of Council Bluffs  
City of Scottsbluff  
Connecting Point  
CoSentry  
Douglas Omaha Technology Commission  
DST Systems, Inc.  
DVAuction  
First National Bank of Omaha  
First National Bank of North Platte  
HCI Holdings, Inc.  
HDR  
Huber Chevrolet  
Information Technology, Inc.  
Lexington Public Schools  
MACC  
Mayer, Burns, Koening & Janulewicz  
McCook Clinic, P.C.  
McCook National Bank  
Mid-Plains Community College  
National Rural Electric Cooperation Association  
Nebraska Dept. of Economic Development  
NMC Inc.  
Norfolk Iron & Metal Co.  
Northeast Community College  
NP Dodge  
NTC  
OCIA International  
Omaha Public Power District  
Panhandle Community Services  
QCI  
Regional West Health Services  
Streck, Inc.  
Take Flight Farms  
Tenneco  
The Computer Guy  
University of Nebraska  
University of North Dakota  
Vanguard Research  
Wheat Belt Public Power District  
Work Ethic Camp

## APPENDIX C: Survey Results

### All Firms

<b>All Employees – All Firms</b>			
	<b>2008</b>	<b>Five Years</b>	<b>Percent Change</b>
Number of All Employees	33,748	35,776	6.0%
Number of All Employees Now Taking Academic Credit Courses	5,680		
Number of All Employees You Feel Should Be Taking Academic Courses	10,920		
Number of Employees Taking Academic Credit Courses on a Company Tuition Reimbursement Program	491		
Education/Training Budget*	\$9,476,000	\$10,274,500	7.4%
Amount of Training Budget for:**			
a) Internally Provided Training Programs	\$1,364,387	\$1,483,130	8.7%
b) External Seminars and Workshops	\$2,298,372	\$2,479,439	7.9%
c) Industry Certificates	\$2,717,985	\$2,945,717	8.5%
d) Tuition and Cost for College Courses	\$2,617,481	\$2,868,923	9.6%
e) Other	\$408,550	\$13,650	1.2%
*26 of the 49 firms provided education/training budget information.			
**24 of the 49 firms provided information on the amounts of their training budget for items 5a-5e.			
Therefore, training budget for items 5a-5e do not equal the total training budget.			

<b>IT Employees – All Firms</b>			
	<b>2008</b>	<b>Five Years</b>	<b>Percent Change</b>
Number of IT Employees	3,996	4,752	18.9%
Number of IT Employees Now Taking Academic Credit Courses	432		
Number of IT Employees You Feel Should Be Taking Academic Courses	818		
Number of Employees Taking Academic Credit Courses on a Company Tuition Reimbursement Program	120		
Number of IT Employees Now Taking Industrial Certification Courses	246		
Education/Training Budget – IT Employees Only	\$987,405	\$1,145,741	16.0%

## Profile of Academic Disciplines for Information Technology Employees

<b>Estimated Percent of Employees by Academic Disciplines</b>			
<b>Academic Discipline</b>	<b>Rank Importance of Discipline to Your Firm</b>	<b>% IT Employees with these Disciplines in 2008</b>	<b>% IT Employees with these Disciplines in Five Years</b>
Electronic Engineering	3.22	0.9	0.8
Telecommunications	2.30	1.7	2.5
Systems Integration	1.81	12.4	13.1
Computer Engineering and Systems	2.22	19.0	18.7
Systems Development and Business Integration	1.83	28.9	29.3
Technology Management	1.85	9.0	7.8
Technical Marketing	3.13	1.5	2.6
E-commerce	2.26	6.7	9.1
Networking (LAN/WAN/IP)	1.61	6.9	7.2
Other (Primarily Mainframe)	n/a	13.5	9.0
	% Sub-baccalaureate	39.3	27.7
	% Baccalaureate	45.4	51.9
	% Graduate	15.3	20.4

<b>Estimated Number of Employees by Academic Disciplines</b>				
<b>Academic Discipline</b>	<b>Rank Importance of Discipline to Your Firm</b>	<b># IT Employees with these Disciplines in 2008</b>	<b># IT Employees with these Disciplines in Five Years</b>	<b>Percent Change</b>
Electronic Engineering	3.22	55	53	-3.6
Telecommunications	2.30	102	174	70.6
Systems Integration	1.81	747	925	23.8
Computer Engineering and Systems	2.22	1152	1317	14.3
Systems Development and Business Integration	1.83	1751	2071	18.3
Technology Management	1.85	544	547	0.6
Technical Marketing	3.13	91	185	103.3
E-commerce	2.26	398	641	61.1
Networking (LAN/WAN/IP)	1.61	398	511	28.4
Other (Primarily Mainframe)	n/a	815	637	-21.8
	# Sub-baccalaureate	1780	1246	-30.0
	# Baccalaureate	2046	2308	12.8
	# Graduate	731	923	26.3

## IMPORTANCE OF APPLIED AREAS

Applied Areas	*Rank of Applied Area	**Needs Met by Colleges and Universities	***Difference
<b>Electronic Engineering</b>			
– Computer Systems / Architecture	2.57	2.14	-0.43
– Directories, Circuits and Systems	3.15	2.36	-0.79
– Comm's, Control and Signal Processing	2.92	2.38	-0.54
– Other			
<b>Telecommunications</b>			
– Protocols, ATM, TCP/IP/Frm. Relay, ADSL	2.00	2.16	0.16
– Wireless	2.02	2.32	0.30
– Telephony	2.02	2.48	0.46
– Fiber Optics	2.44	2.51	0.07
– Other			
<b>Systems Integration</b>			
– Software / Hardware Configuration	1.53	2.02	0.49
– LAN/WAN	1.62	2.07	0.45
– Technical Purchasing (RFI, RFP, ROI)	2.66	2.54	-0.12
– Applied Mfg, Production, Operations	3.19	2.56	-0.63
– Installation/Implementation	1.91	2.07	0.16
– Quality Assurance	2.11	2.45	0.34
– Other			
<b>Computer Engineering and Systems</b>			
– Operating Systems/Compilers/Tools	2.17	2.27	0.10
– Language/CASE	2.90	2.41	-0.49
– AI/ES/Inference Engines	3.40	2.59	-0.81
– Architectures/Platforms	2.56	2.45	-0.11
– Capacity and Performance Planning	2.54	2.64	0.10
– Numerical Computing, Algorithms	3.23	2.55	-0.68
– Operations Research	3.13	2.66	-0.47
– Standards/Documentation	2.49	2.67	0.18
– Other			
<b>Systems Development and Business Integration</b>			
– Methodology	2.13	2.41	0.28
– Data Warehousing	2.22	2.48	0.26
– Client/Server	1.67	1.98	0.30
– Business Planning / Re-engineering	2.30	2.43	0.13
– Human Factors Engineering	2.73	2.57	-0.16
– Design/Programming	2.18	2.25	0.07
– Other	2.42	2.40	-0.02



<b>Technology Management</b>			
– Project Management	1.71	2.44	0.73
– Business Planning Strategies / Tactics	2.12	2.44	0.32
– Specific Technical Competencies	2.08	2.31	0.23
– Communication Law, Regulations	2.71	2.59	-0.12
– Legal/Ethical/Human Resource Mngt	2.42	2.43	0.01
– Technology and Social/Economic Change	2.62	2.50	-0.12
– Other			
<b>Technical Marketing</b>			
– Business Planning, Strategies, Tools	2.53	2.69	0.16
– Technical Competencies	2.45	2.44	-0.01
– Marketing Concepts	2.91	2.66	-0.25
– Other			
<b>E-commerce</b>			
– Development Technologies	2.43	2.40	-0.03
– Legal/Public Policy Issues	2.60	2.56	-0.04
– Business Opportunity/Risk	2.47	2.56	0.09
– Management and Control	2.43	2.49	0.06
– Security	1.87	2.47	0.60
– Other			
<b>Networking (LAN/WAN/IP)</b>			
– Protocols – Open and Proprietary	1.83	2.31	0.48
– Integration	1.74	2.45	0.71
– Convergence	1.87	2.55	0.68
– Servers, Bridges, Routers and Hubs	1.51	2.17	0.66
– Security, Encryption and Firewalls	1.43	2.31	0.88
– Continuity, Interruption and Recovery	1.63	2.48	0.85
– Other			
<b>Overall Average</b>	<b>2.32</b>	<b>2.41</b>	<b>0.09</b>

\*Rank 1 = Most Important 4 = Least Important

\*\*Rank 1 = Meets Needs 4 = Does Not Meet Needs

\*\*\*A positive value suggests needs are not being met. A negative value suggests needs are being met.

## RANKING OF TECHNOLOGY FIRMS

Technology Areas Rank*	2008	Five Years
– Languages	2.52	2.33
– Data	1.54	1.49
– Telecommunications	1.70	1.62
– Client/Server	1.76	1.60
– Human Factors Engineering	2.74	2.53
– Educational Technologies / Learning Services	2.48	2.33
– E-commerce	2.54	2.02
– CAD/CAM/CAE	3.15	2.87
– Object-oriented Design	2.72	2.47
– Artificial Intelligence	3.33	3.09
– Multimedia – The Technologies	2.48	2.18
– Multimedia – The Presentation	2.44	2.11
– Virtual Reality	3.20	2.96
*Rank 1 = Most Important 4 = Least Important		

## IT CERTIFICATIONS

Certifications	*Rank in 2008	*Rank in Five Years
<b>Vendor Certifications</b>		
– Microsoft	2.26	2.11
– Novell	3.65	3.54
– Lotus Notes	3.67	3.67
– Cisco	2.44	2.33
– Oracle	3.24	3.20
– People Soft	3.59	3.56
– Linux	3.04	2.76
– Other		
<b>Technologies</b>		
– WAN/LAN	1.82	1.73
– TCP/IP	1.96	1.86
– VPN	2.16	1.82
– Wireless	2.07	1.80
– Other		
<b>Professional/Other</b>		
– Project Management (PPM)	2.26	1.96
– Security (SANS/CISSP)	1.87	1.73
– Disaster Planning and Recovery	2.00	1.78
– A+	2.83	2.82
– Net+	2.80	2.73
– Other		
<b>Programming and Development</b>		
– XML	2.67	2.27
– Java/JavaScript	2.60	2.31
– HTML	2.45	2.24
– C++	3.11	3.00
– Visual Basic	2.96	2.89
– Other		
<b>Database</b>		
– Oracle	3.23	3.09
– SQL	2.15	2.02
– MS-SQL	2.56	2.33
– DB2	2.25	2.32
– Crystal Reports	3.06	2.91
– Other		
*Rank 1 = Most Important 4 = Least Important		

## COLLEGE RESPONSIVENESS TO FIRMS' NEEDS

<b>Rank Responsiveness of Area Initiatives in Meeting Your Firm's Educational Needs in IT</b>	<b>*Rank of Area</b>
– Private Trade Schools	2.05
– Community Colleges / Technical Institutes	1.63
– Four-year Colleges and Universities	1.96
<b>How Prepared are Graduates to Meet Your Firm's Job Requirements?</b>	<b>*Rank of Area</b>
– Private Trade Schools	2.02
– Community Colleges / Technical Institutes	1.69
– Four-year Colleges and Universities	1.78
*Rank 1 = Very Responsive 4 = Seldom Responsive	