Rural/Urban Variations in Business Requirements for Educational Services in Information Technology

Comparing Midwestern 2002 Survey and 1999 Greater Omaha Survey Results

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North Dakota State College of Science
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Northeast Community College (Nebraska)
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The Midwest Center for Information Technology
is a virtual entity – a partnership of 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.

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Executive Summary

In 1999, the Applied Information Management (AIM) Institute completed a major study of Business Requirements for Educational Services in Information Technologies for Greater Omaha firms.

In 2002 AIM, in partnership with ten community colleges across the Midwest, received a grant from the National Science Foundation (NSF) to create the Midwest Center for Information Technology. A requirement of the NSF grant was to evaluate business requirements for educational services in Information Technology across the service areas of these community colleges. The study was completed in the summer of 2002.

The 1999 and 2002 studies provide a unique opportunity to compare rural and urban variations in business requirements for educational services in Information Technology. With only two firms participating in both studies, the comparison is between two distinctly different populations:

- 124 firms located in more rural areas with an average of 260 employees.
- 43 urban firms with an average of 1,546 employees.

While three years separate the two surveys, the dynamic impact of changing Information Technologies on business practices remained consistent throughout the period. The results clearly indicate that while economic conditions in 1999 were more robust than in 2002, the only effect was a slower growth in the economy, not a change in the role of IT within the business enterprise.

This study documents both similarities and variations in business requirements for educational services in Information Technology (IT).

Similarities

The similarities are quite significant suggesting that firms of all sizes, no matter their location, are being driven by profound changes in Information Technology. These similarities are:

The Impact of Telecommunications, Networking and E-commerce -

These three Academic Disciplines were ranked very important by both urban and rural employers. In the next five years, the total employment in these three IT professional fields will grow to nearly one-third of all IT professionals, creating a demand for educational services in these disciplines.

Training Budgets -

Both urban and rural firms are spending more than four times as much per employee to train their IT professionals than the average for all employees. Tuition reimbursement budgets were smaller than all other training budget categories.

Executive Summary

Academic Disciplines -

The Academic Disciplines of Networking, Systems Integration and Systems Development & Business Integration were ranked very high by both urban and rural employers.

Applied Areas -

48 different Applied Areas or courses in the various Academic Disciplines were ranked. 15 of the top ranked disciplines were identical for both urban and rural employers. These findings suggest both groups are facing essentially the same challenges as they respond to changing market forces driven by IT.

College Responsiveness -

Neither urban nor rural employers ranked colleges and universities as "meeting their needs" in any high ranked Applied Area. This pattern reflects rapidly changing market requirements for educational services that largely "swamp" the ability of schools to respond with appropriate courses and faculty.

Educational Achievement of Workers -

About 40% of the IT employees have sub-baccalaureate degrees for both urban and rural employers. Both groups want higher percentages of their employees to hold baccalaureate and graduate degrees in the future. This creates a demand for colleges and universities to produce educational opportunities, while highlighting the need to remove barriers to progressively higher degrees by employees.

Differences

There were also marked differences between urban and rural employers. Those differences included:

The Way Training Budgets Are Spent -

Rural employers are spending about 25% of their training budgets on internal programs, compared to twice that amount by urban employers. This pattern may reflect, in part, the ability of larger firms to have more robust internal training options than smaller firms.

Meanwhile, the rural employers spent over one-third of their training budgets on external seminars and workshops – twice the rate of their urban counterparts. This represents good continuing education opportunities for content providers in rural areas.

Finally, Vendor Certifications commanded a much higher percentage of the rural firms' training budgets than those of urban employers.

Executive Summary

Firm Size -

The 2002 study had an average firm size of only 260 employees compared to an average of 1,546 for the urban counterparts. This creates substantial differences, particularly for the smallest employers who have greater difficulty in providing the infrastructure to train and support employees. Also, those in the most rural areas are less likely to have robust technical and professional services within their community.

Projected Employment Growth -

Urban employers projected over 20% growth between 1999 and 2004 in both total employment and IT employment. The rural firms projected about 9% growth for total employment and 12% for IT employment between 2002 and 2007. This difference reflects, in part, the slower economic conditions that existed in the 2002 study, compared to the more robust period in 1999 when the Greater Omaha study was completed.

Tuition Reimbursement -

The firms in the rural study had a significantly lower percent of students on tuition reimbursement for both IT employees and all employees. This may reflect slower economic conditions in the 2002 study of rural firms. In addition, many rural areas do not have a postsecondary institution within their community, and this may reduce the demand on rural firms for reimbursement programs.

Introduction

In 1999 the Applied Information Management (AIM) Institute completed a major study of Business Requirements for Educational Services in Information Technology for Greater Omaha firms. The study included information from 43 Greater Omaha employers with total employment of 66,493. Of that total, 5,321 were Information Technology professionals.

The 1999 study 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 1999 study also estimated the size of corporate educational budgets and IT employment. This 1999 study, and a similar study completed in 1995, proved instructive for the education and business community alike. Figure 1 on the following page provides the demographic background of employers and employment in this five county region.

In 2002 AIM, in partnership with ten community colleges across the Midwest, received a grant from the National Science Foundation to create the Midwest Center for Information Technology. Requirements of the grant included measuring and documenting demand for IT education from employers in the areas served by the participating schools. A survey instrument, very similar to the 1995 and 1999 Greater Omaha surveys, was used and the results reported in a study entitled "Midwestern Regional Business Requirements for Educational Services in Information Technology." Figure 2 on page 6, provides the demographic background of employers and employment in this Midwestern region.

The 2002 Midwest and 1999 Greater Omaha studies provide, for the first time, the opportunity to document differences in IT educational services between urban and rural areas. There are numerous conditions that might suggest different requirements exist, including:

- Greater number of mainframe-based operations in urban areas.
- Greater choice in educational opportunities in urban areas.
- Generally a more robust communications infrastructure (broadband, support facilities, more vendors, etc.) in urban areas.
- Larger pool of technical professionals in urban areas.

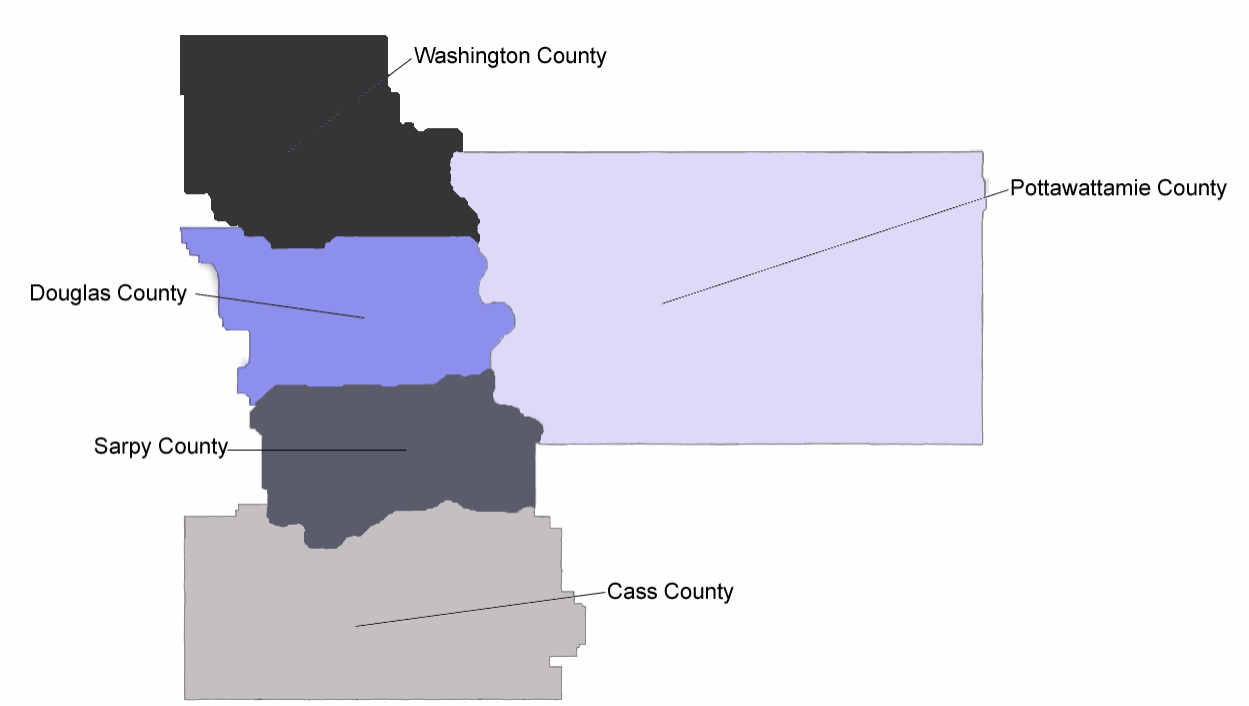
Economic conditions were different between the two survey periods. A robust economy with very tight labor availability existed in 1999, while a weaker economy with somewhat higher unemployment rates prevailed in 2002. The role of IT in the future of business, however, was unchanged. This comparison could be very instructive to rural and urban educational and business institutions alike.

This report documents variations in findings from the Greater Omaha 1999 study and the 2002 Midwest regional study.

Figure 1

Midwest Center for Information Technology

Greater Omaha Counties – Cass, Douglas, Pottawattamie, Sarpy, Washington



Greater Omaha Labor Statistics

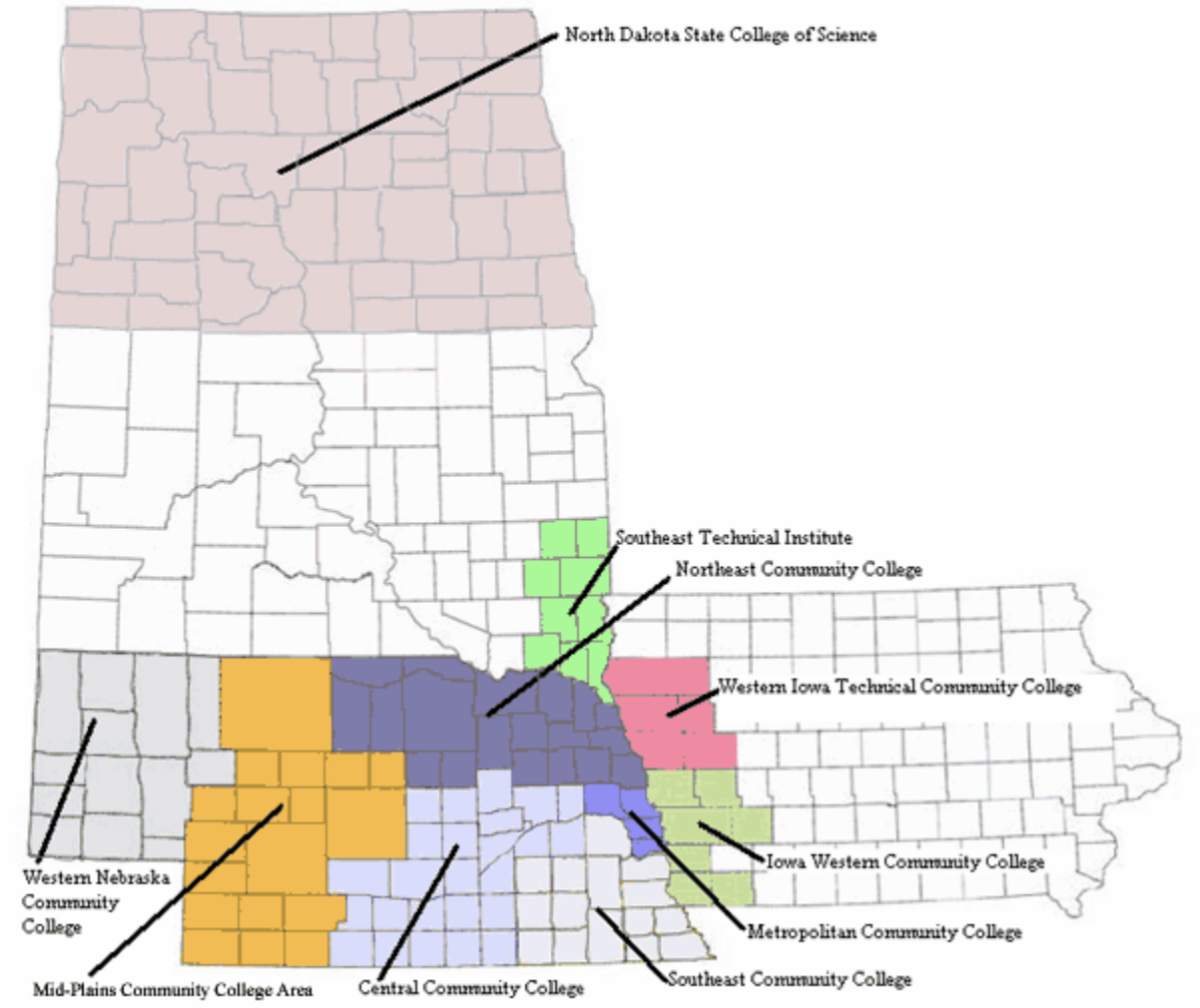
County, State	Labor Force (May 2002)	Number of Employers* (June 2002)	Number of Employers* 1-99 Employees (June 2002)	Number of Employers* 100+ Employees (June 2002)
Cass County, NE	13,359	827	804	4
Douglas County, NE	267,049	22,048	21,122	578
Pottawattamie County, IA	50,938	3,291	3,143	69
Sarpy County, NE	63,552	3,373	3,257	61
Washington County, NE	11,185	835	786	11
Total Greater Omaha	**406,083**	**30,374**	**29,112**	**723**

Sources: DirectoriesUSA.com
U.S. Department of Labor, Bureau of Labor Statistics

* Not all employers recorded their employee size.

Midwest Center for Information Technology

Figure 2 Four State Region – North Dakota, South Dakota, Nebraska and Iowa



Midwestern Regional Labor Statistics

Community College	Labor Force (May 2002)	Number of Employers* (June 2002)	Number of Employers* 1-99 Employees (June 2002)	Number of Employers* 100+ Employees (June 2002)
Central Community College	168,538	16,900	16,029	209
Iowa Western Community College	91,012	7,804	7,375	107
Metropolitan Community College	358,597	28,218	26,934	290
Mid-Plains Community College Area	50,096	6,582	6,196	35
North Dakota State College of Science	340,820	11,645	352,465	125
Northeast Community College	88,212	9,279	8,804	75
Southeast Community College	244,444	21,033	19,182	356
Southeast Technical Institute	122,395	20,591	10,954	239
Western Iowa Technical Community College	94,083	9,054	8,468	137
Western Nebraska Community College	48,972	5,827	5,582	43
Total Midwestern Regional	**1,606,169**	**136,933**	**461,989**	**1,616**

Sources: DirectoriesUSA.com
U.S. Department of Labor, Bureau of Labor Statistics

* Not all employers recorded their employee size.

Introduction

A. Employment

The 2002 summary of Midwestern firms included 124 participants with total employment of 32,206. These employers had an average of 260 employees; however, the range was from one employee to 4,013 employees. There were 46 firms with employment of 100 or more (average size 646) and 78 firms with less than 100 employees (average size 32).

The 1999 Greater Omaha survey had only 43 respondents but their total employment was 66,493 or an average of 1,546 employees per firm. That study had 33 employers with 100 or more employees (average size 2001) and 10 small employers with less than 100 employees (average size 44).

SUMMARY STATISTICS
2002 and 1999 Studies
All firms

	Midwest *2002*	Omaha *1999*
Number of Firms	124	43
Total Employment	32,206	66,493
Average Employment Per Firm	260	1,543

Information Technology employment totaled 1,873 for the 124 Midwestern firms, while Greater Omaha IT employment in the 1999 study was 7,616. Both Midwestern employers and the Greater Omaha employers were projecting growth; however, the more rural employers projected growth rates over the next five years at about one-half the growth expected by Omaha employers. This pattern was true for both total employment and Information Technology employment.

It is somewhat difficult to document why the growth rates were this different. Neither the 1999 Greater Omaha or the 2002 Midwestern study asked respondents to explain the forces driving employment growth. A general understanding of different economic conditions may partly explain the difference:

- During 1999, Greater Omaha was experiencing a very robust economy with unemployment well below 2% and rapid growth in demand for employees.
- During the first six months of 2002 when the survey documents were completed, economic conditions could be characterized as a mild recession across the Midwest.
- The manufacturing sector of the Midwest economy had been in a prolonged slow down by 2002. Manufacturing is much more prevalent in rural areas than in the Greater Omaha area.

Information Technology employees constituted 5.5% of the workforce for the 124 firms. This is well below the 11.5% for Greater Omaha firms. However, for the 78 smallest Midwestern firms, IT employees were 10.7% of all employees, nearly equal to their urban counterparts. Both studies likely understate the number of IT professionals because most firms reported only their computer center employees as IT professionals. This reporting may understate those IT professionals doing sales, training, marketing, working on the factory floor and other departmental IT professionals.

SUMMARY STATISTICS
2002 and 1999 Studies
All firms

	Midwest *124 firms*	Omaha *43 firms*
Total Employment	32,206	66,493
Projected Employment in Five Years	35,157	81,812
Percent Change	9.2%	23.0%
Information Technology Employment		
Total IT Employment	1,873	7,616
Projected Employment in Five Years	2,089	9,339
Percent Change	11.5%	22.6%

B. Training Budgets

Training budgets for the 73 Midwestern firms reporting these data were $4,522,371, well below the $14,256,797 for the 30 Greater Omaha firms reporting these data in 1999. In addition, the Midwestern firms projected a 35% growth to $6,110,000 in the next five years, while the Omaha employers anticipated a 73% increase to $26,068,000 in the five years following their 1999 reporting. These results also under report training budgets in both studies because not all employers provided these data and many reported that their training budgets were incomplete.

While the absolute value is quite different, the expenditure per employee was much closer for the two groups. To illustrate, in 2002 the Midwestern firms anticipated spending $256 per employee, growing to $312 in five years. The Greater Omaha firms planned to spend $372 in 1999, increasing to $519 in five years.

Training Budgets – All Employers
2002 & 1999
All Firms

	Midwestern Firms 2002		Gr. Omaha Firms 1999	
	Current	**5-Year Projection**	**Current**	**5-Year Projection**
Training Budgets	$4,522,371	$6,110,000	$14,256,797	$26,068,000
Number of Firms Reporting	73	73	30	30
Avg. Training Budget Per Employee	$ 256	$ 312	$ 372	$ 519
Avg. Training Budget Per IT Employer	$ 1,345	$ 1,370	$ 1,871	$ 2,427

A very similar pattern also existed for Information Technology professionals. The Midwestern employers reporting these data planned to spend $1,345 per IT employee in 2002, growing to $1,367 in five years. Greater Omaha firms planned to spend $1,871 per IT employee in 1999, growing to nearly $2,427 in five years.

While the numbers varied, both groups of employers are directing substantial resources to train their employees, particularly Information Technology employees. These patterns reflect the rapid changes within the IT industry, including all facets of computer, communications, business applications and systems software developments. Their increased expenditures also reflect the disproportionate growth in IT employment compared to all employees.

C. How Training Budgets Are Spent

A somewhat different pattern is evident in training expenditures as shown in the following table. This difference appears to be influenced, in part, by firm size. The average number of employees for the 124 Midwestern regional firms was 260 compared to 1,546 for the Greater Omaha firms. Many larger firms have internal training programs covering a broad array of topics relevant to their employees. Smaller Midwestern firms more frequently use outside resources for such training requirements. The 124 Midwestern regional firms reported that 26% of their training budget was for internal programs versus 53% for the Greater Omaha firms. Meanwhile, the Midwestern firms' use of external seminars/workshops (36%) was more than double (17.4%) their urban counterparts.

Tuition/costs for college was the lowest percentage of the budget for both groups of employers at 6.9% for Midwestern firms and 12.1% for Greater Omaha employers.

Finally, in recent years, industry certifications have grown in importance to employers as a means for employees and applicants to validate their mastery of a body of knowledge.

At 27.1% of their training budget, the rate of spending by regional firms on Vendor Certifications is nearly twice that projected (13.7%) by urban employers. Both groups are spending more on Vendor Certifications than for college tuition.

Training Budget Allocation
2002 & 1999 Studies
Percent of Total Budget

	Midwestern Firms 2002		Gr. Omaha Firms 1999	
	Current	**5-Year Projection**	**Current**	**5-Year Projection**
Internal Programs	25.6%	29.7%	52.2%	58.6%
External Seminars/Workshops	36.1%	31.8%	17.4%	14.7%
Tuition/Cost for College	6.9%	9.8%	12.1%	13.8%
Vendor Certifications	27.1%	26.3%	13.7%	10.6%
Other	4.4%	2.4%	4.0%	2.2%

D. Employees & Academic Courses

The percent of all employees taking academic courses was slightly higher for the 124 Midwestern firms (11.2%) compared to 8.3% for Greater Omaha employers. For the Information Technology employees, a similar pattern existed, 10.0% for rural employers versus 8.1% for their urban counterparts.

In both studies, firms believed that nearly three to four times more Information Technology employees should be taking courses than are now enrolled. Tuition reimbursement programs continue to be important; however, the Midwest regional firms only had 19% of their employees on reimbursement programs, less than half the rate for urban employers. While the survey data does not provide detailed insight into the difference between the two studies, an observation may be relevant:

- The economic slow down between the 1999 and 2002 studies may have caused some firms to reduce training and education reimbursement budgets.
- Some of the more rural firms may not be located in communities that have a postsecondary education presence, reducing opportunities and hence demand for tuition reimbursement programs.

Tuition Reimbursement Programs
2002 & 1999 Studies

	Midwestern Firms 2002		Gr. Omaha Firms 1999	
	All Employees	**IT Employees**	**All Employees**	**IT Employees**
Number of Employees in Courses	3,618	187	5,321	615
Number on Tuition Reimbursement	684	59	2,496	323
Percent on Tuition Reimbursement	18.9%	31.6%	46.9%	52.5%
Number That Should Take Courses	6,826	747	9,845	1,701

Academic Disciplines

Table 1 shows the ranking of nine different Academic Disciplines. As stated earlier, business is in a profound period of change. Digitization of the world's knowledge and global networks is having an unparalleled impact on all business, commerce, education, social institutions, expectations, market perspective, etc.

In recent years, many organizations' view of Information Technology has moved from an "important operational issue" to a "strategic issue for the firm." The following rankings are instructive to employers and academic institutions alike as they respond to the increased reliance upon Information Technology and this changing importance of different disciplines.

Table 1

Profile of Academic Disciplines for IT Employees

All Firms
2002 & 1999 Studies

	Midwestern Firms		Gr. Omaha Firms	
Academic Disciplines	*2002 Rank*		*1999 Rank*	
Networking (LAN/WAN/IP)	1.24	1st	1.11	2nd
Systems Integration	1.39	2nd	1.13	3rd
Telecommunications	1.72	3rd	1.36	6th
Systems Development & Business Integration	1.74	4th	1.05	1st
Technology Management	1.83	5th	1.19	4th
Computer Engineering & Systems	1.93	6th	1.72	7th
E-commerce	1.95	7th	1.25	5th
Electronic Engineering	2.59	8th	2.39	9th
Technical Marketing	2.98	9th	2.06	8th
Rank 1= Most Important 4 = Least Important				

Networking and Systems Integration ranked first and second in importance, respectively, for the Midwest regional firms. Those two disciplines ranked second and third, respectively, for the Greater Omaha employers. The relatively high consistency between both groups suggests that no matter the size and geographical location, the future competitiveness of their firms is tied to adequate IT professionals.

Systems Development & Business Integration was the highest ranked Discipline for Greater Omaha firms reflecting, in part, a more mainframe environment. It ranked fourth for Midwest regional firms. This Discipline also accounts for the largest IT employment. Table 2 shows, however, that the percent of total IT employment is trending down for this category. This downward trend in the percentage of employees comes as the demand for E-commerce, Telecommunications, and Networking increases. However, with total IT employment expected to increase, the actual numbers of employees will not decline as much as percentage figures seem to indicate.

Table 2

Estimated Percent of Employees
By Academic Disciplines

All Firms
2002 & 1999 Studies
Percent of IT Employees with These Disciplines

Academic Disciplines	Midwestern Firms 2002		Gr. Omaha Firms 1999	
	Current	5-Year Projection	Current	5-Year Projection
Electronic Engineering	7.1%	7.2%	1.8%	1.0%
Telecommunications	9.4%	9.7%	8.5%	9.6%
Systems Integration	11.9%	12.4%	17.2%	14.6%
Computer Engineering & Systems	9.5%	10.3%	14.2%	13.8%
Systems Development & Business Integration	20.3%	17.4%	35.7%	25.5%
Technology Management	10.3%	9.6%	7.8%	8.5%
Technical Marketing	4.6%	5.3%	1.9%	2.8%
E-commerce	8.0%	9.1%	4.1%	12.1%
Networking (LAN/WAN/IP)	11.7%	12.4%	8.8%	10.5%
Other	-	-	-	-
Sub-Baccalaureate	40.1%	30.4%	41.3%	38.2%
Baccalaureate	50.2%	53.3%	47.6%	48.3%
Graduate	9.7%	16.3%	11.0%	13.6%

A. Telecommunications, Networking and E-commerce

The big story in Academic Disciplines appears to be the growing relevancy in Telecommunications, Networking, and E-commerce. In the earlier 1995 Greater Omaha study, Telecommunications/Networking accounted for 8.6% of all IT employees with a projection to grow to 9.1%. E-commerce as a discipline did not exist in nearly any academic institution at that time. Today, those three disciplines account for 21% and 29% respectively, of Information Technology employment for Greater Omaha and Midwest employers. It is projected to grow to nearly one-third of the IT staff for both groups of employers.

Fastest Growing Academic Disciplines All Firms 2002 & 1999 Studies Percent of IT Employees with These Disciplines				
	Midwestern Firms 2002		Gr. Omaha Firms 1999	
	Current	5-Year Projection	Current	5-Year Projection
Academic Disciplines				
Telecommunications	9.4%	9.7%	8.5%	9.6%
Networking (LAN/WAN/IP)	11.7%	12.4%	8.8%	10.5%
E-commerce	8.0%	9.1%	4.1%	12.1%
Totals	29.1%	31.2%	21.4%	32.2%

B. E-commerce

E-commerce was a new Academic Discipline in the 1999 study. This discipline is at the center of the emerging networked/digital world. Academic institutions that wish to keep curriculum and programs relevant with emerging business trends must develop strong Telecommunications, Networking, and E-commerce courses and programs. This represents a change from classic "computer" based programs (systems design and development, operating systems, engineering, etc.) to the integration and convergence of computer and communication technologies that lead to a new and emerging business and application paradigm.

E-commerce is also the most interdisciplinary topic on the horizon, including many other disciplines such as law, marketing, public policy, music and art, language, graphics, all business disciplines, all Information Technology and engineering disciplines, etc.

C. Educational Achievement of Workers

One-year and two-year IT programs will continue to offer excellent entry opportunities for a career in IT. However, firms in both surveys expressed a desire for more employees with baccalaureate and graduate degrees. With over 40% of all IT employees in both surveys with sub-baccalaureate degrees, substantial opportunities exist for non-traditional student educational offerings.

The data also suggest that migration paths between a community or a technical college degree to a baccalaureate degree must be clear of barriers. This suggests the need for strong articulation agreements between academic institutions that will support both the firm and employees' needs. Also, more distance learning options, courses offered on the firm's premises, and other continuing education opportunities would serve rural and urban employees alike.

Applied Areas

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. The average ranking for all 48 Applied Areas was 2.09 and 1.71, respectively, for the Midwestern and Greater Omaha respondents. Their evaluations of "meets needs," however, were 2.71 and 2.43, respectively. This high average difference between the rank of Applied Areas and their evaluation of how colleges were "meeting their needs" suggest both groups of employers believe colleges and universities are not meeting their needs as effectively as they would like.

Further analysis of the data from the Midwestern firms shows that individual Applied Areas ranked highest also had the poorest "meets need" score. In fact, in only 2 of the 22 highest ranked academic disciplines did the "meets needs" measurement fall below the average difference of .62:

- Client/Server
- Development Technologies

The pattern was the same for the Greater Omaha firms in which only 2 of the 18 highest ranked Applied Areas had "meets needs" below the average difference of .72:

- Architectures/Platforms
- Client/Server

Neither survey documents why the colleges and universities are considered to not meet needs. In many cases, the newest technologies of Telecommunications, E-commerce, and Networking (LAN/WAN/TCP/IP) are disciplines where the colleges and universities were considered least responsive.

The 124 Midwestern firms ranked 22 Applied Areas between 1.0 and 2.0, while the 43 Greater Omaha firms ranked 18 Applied Areas 1.0 to 1.5. The 15 Applied Areas that were identical for both sets of firms are shown in Table 3. Only seven Applied Areas were unique to the Midwestern firms and only three were unique to the Greater Omaha firms.

Applied Areas

Table 3 shows that 15 of these Applied Areas were ranked most important in both the Midwestern and Greater Omaha surveys. They are:

- Protocols, ATM, TCP/IP
- Software/Hardware Configuration
- LAN/WAN
- Quality Assurance
- Architecture/Platforms
- Client/Server
- Design Programming
- Project Management
- Development Technologies
- Security
- Protocols (Open & Proprietary)
- Integration
- Servers, Bridges, Routers and Hubs
- Security Encryption
- Continuity, Interruption and Recovery

The seven high scoring Applied Areas unique to the 2002 Midwestern study:

- Telephony
- Fiber Optics
- Standards/Documentation
- Methodology
- Data Warehousing
- Decision Support Systems
- Convergence

The Greater Omaha 1999 study had three Applied Areas unique to that study:

- Installation/Implementation
- Operating Systems/Compilers/Tools
- Specific Technical Competencies

Table 3

Highest Ranked Applied Areas – All Firms
2002 & 1999 Studies

Midwest 2002 Applied Area Rankings				Omaha 1999 Applied Area Rankings	
Needs Met by** Coll & Univs (Ranked between 1.0 & 2.0)	Rank* All Firms			Rank* All Firms	Needs Met By** Coll & Univs (Ranked between 1.0 & 1.5)
			TELECOMMUNICATIONS		
2.98	1.44		Protocols, ATM/TCP/IP, etc.	1.32	2.64
2.92	1.87	←	Telephony		
2.86	1.92	←	Fiber Optics		
			SYSTEMS INTEGRATION		
2.75	1.68		Software/Hardware Configuration	1.20	2.63
2.83	1.39		LAN/WAN	1.12	2.11
			Installation/Implementation →	1.22	2.94
3.05	1.61		Quality Assurance	1.39	2.27
			COMPUTER ENGINEERING & SYSTEMS		
			Operating Systems/Compilers/Tools →	1.32	2.13
2.80	1.76		Architectures/Platforms	1.34	1.96
2.70	1.75	←	Standards/Documentations		
			SYSTEMS DEVELOPMENT & BUSINESS INTEGRATION		
3.03	1.97	←	Methodology		
2.75	1.76	←	Data Warehousing		
2.19	1.77		Client/Server	1.38	1.94
2.24	1.49		Design/Programming	1.11	1.87
2.72	1.83	←	Decision Support Systems		
			TECHNOLOGY MANAGEMENT		
2.82	1.79		Project Management	1.16	2.38
			Specific Technical Competencies →	1.38	2.67
			E-COMMERCE		
2.24	1.75		Development Technologies	1.41	2.58
3.09	1.36		Security	1.28	2.92
			NETWORKING (LAN/WAN/TCP/IP)		
3.01	1.92		Protocols (Open & Proprietary)	1.27	2.19
3.05	1.60		Integration	1.18	2.60
3.12	1.62	←	Convergence		
3.02	1.38		Servers, Bridges, Routers & Hubs	1.33	2.63
3.23	1.31		Security Encryption	1.44	2.70
3.31	1.31		Continuity, Interruption & Recovery	1.36	2.66

** Rank 1 = Most Important 4 = Least Important*
*** Rank 1 = Meets Needs 4 = Does Not Meet Needs*

Technology Areas

The two studies send some relatively clear signals in certain Technology Areas, as shown in Table 4.

Data is projected to have increased importance in the next five years, just as it does currently for both Midwestern (2002) and Greater Omaha (1999) firms. Over nearly ten years of AIM studies, Data has consistently scored very high as a technology. What is changing is the broadening array of issues associated with Data, such as warehousing it, mining it, securing it, communicating it, encrypting it, managing it, etc. Data will remain an important area for study and teaching for quite some time.

Telecommunications was ranked highest in the 2002 study by Midwestern firms and second highest in the 1999 study of the Greater Omaha firms (Table 4). It is anticipated to be of greater importance in five years by both groups.

Client/Server ranked in the top four in importance for both groups.

Human Factors Engineering was ranked below average in both studies. However, in the future, these topics appear to command greater interest.

Electronic Commerce (E-commerce) was not ranked in the 1999 Greater Omaha study. It was ranked third highest by the 124 Midwestern firms in 2002.

Table 4

Technology Areas Ranked Between 1.0 & 2.0
All Firms
2002 & 1999 Studies

	Midwestern Firms 2002		Gr. Omaha Firms 1999	
Technology Areas	Current	5-Year Projection	Current	5-Year Projection
Languages	2.22	2.14	1.87	1.62
Data	1.67	1.28	1.54	1.31
Telecommunications	1.46	1.36	1.72	1.32
Client/Server	1.99	1.37	1.92	1.70
Human Factors Engineering	2.42	1.99	2.39	1.84
Educational Technology – Learning Services	2.45	2.51	2.48	1.84
Electronic Commerce	1.82	1.96	-	-
Multimedia – Technology	2.53	2.14	2.56	1.77
Multimedia - Presentation	2.35	2.37	2.55	2.00
Rank 1= Most Important 4= Least Important				

Vendor Certifications & Other Special Topics

Vendor Certifications have become increasingly popular with firms and employees alike. The range of software/hardware vendors with certification programs has increased. Many employers pay for certification classes, and students who successfully complete certification testing frequently enjoy increased salary and enhanced value to their employer.

Vendors are also making certification content available to secondary schools. Currently, several urban and rural Midwestern high schools offer Cisco certification classes. Cisco and other certification classes are also offered by colleges and universities. Some colleges include certification content in their courses, allowing the student to receive academic credit plus being prepared to take the Vendor Certification exam upon completion of the course.

Table 5 below shows how the Midwestern and Greater Omaha firms ranked Vendor Certifications. Microsoft was highly ranked by both sets of employers.

Table 5

Ranking of Vendor Certifications
All Firms
2002 & 1999 Studies

	Midwestern Firms 2002		Gr. Omaha Firms 1999	
Vendor Certification	Current	5-Year Projection	Current	5-Year Projection
Microsoft	2.81	2.34	1.66	1.48
Novell	3.45	3.38	3.25	3.45
Cisco	2.84	2.42	2.48	2.56
Lotus Notes	3.64	3.58	2.49	2.49
Oracle	3.17	2.80	1.64	1.67
PeopleSoft	3.82	3.67	2.62	2.69
Linux	3.88	3.24	-	-
Rank 1= Most Important 4= Least Important				

In the 2002 Midwestern study, additional special topics were ranked. These rankings (shown below) illustrate that communication technologies and database issues are considered important by employers. Project Management ranked below average at 2.56; however, with a score of 1.27 in 5 years, it is the most important or highest ranked area in the future. Appendix C shows a complete list and scoring of these professional development topics for the 124 Midwestern firms.

Table 6

RANKING OF PROFESSIONAL DEVELOPMENT TOPICS
ALL FIRMS

Professional Development Topics	2002 All Firms	In 5 Years All Firms
WAN/LAN	2.08	1.88
TCP/IP	2.07	1.97
VPN	2.88	2.01
Wireless	2.67	1.85
Project Management (PPM)	2.56	1.27
Security (SANS/CISSP)	2.19	2.09
Disaster Planning	2.55	2.11
SQL	2.21	2.09

Rank 1 = Most Important 4 = Least Important

Conclusions

The 2002 study of 124 Midwestern employers, most from smaller communities and rural areas across Nebraska, Iowa, North and South Dakota, shows needs very similar to those reported by 43 urban Greater Omaha employers in 1999. However, important areas of differences were also documented. Both studies had sufficient numbers of firms with sufficient employment to fairly represent the needs of all employers across the region studied. There were only two employers that participated in both studies. The two studies represented two distinctly different populations, both in terms of size of firm and geographical location. As noted above, however, these geographic and demographic differences did not mean they had different demands for educational services in Information Technology.

Average training budgets showed very similar patterns, even though the amounts varied. The 124 Midwestern firms were spending $256 per employee for training, compared to $372 for their Greater Omaha counterparts. However, the more rural employers were spending $1,345 for training per IT professional, compared to $1,871 for the Greater Omaha firms in 1999. Both groups of employers are spending more on their IT employees reflecting, in part, a discipline that is changing so rapidly, employees must train to keep current and relevant.

The average number of employees per firm in the 2002 Midwestern study was 260 compared to 1,546 for the 1999 Greater Omaha study. The practical implication of the different sized firms is suggested in the way training budgets were spent. The Greater Omaha firms were spending 53% of their budgets through internal programs, compared to 26% for the smaller Midwestern firms. For the smaller companies, external workshops were more important at 36% of their budget. Vendor Certifications accounted for 27% of the smaller Midwestern firms training budgets, compared to 14% for the Greater Omaha firms. Finally, tuition reimbursement was the smallest training budget item at 7% for the small Midwestern firms and 12% for Omaha employers.

IT employees accounted for 11.4% of all employees in the larger Greater Omaha firms, compared to 5.5% for the smaller Midwestern firms. This difference reflects, in part, the different nature of business between the two areas. Data-sensitive and communications-sensitive firms with large centralized data processing, communications, developments centers and enterprise-wide electronic platforms, command more IT specialists per employee than some manufacturing, retail, and smaller employers.

Within Academic Disciplines and Applied Areas, the consistency between the smaller Midwestern firms and Greater Omaha employers was very similar. For example, three of the top four Academic Disciplines for the more rural firms were also in the top four Disciplines for the Greater Omaha firms.

Conclusions

Academic Discipline	Midwest Study Ranking 2002	Gr. Omaha Study Ranking 1999
Networking (LAN/WAN/IP)	#1	#2
Systems Integration	#2	#3
Telecommunications	#3	#6
Systems Development & Business Integration	#4	#1

Both groups of employers were focused on the emerging electronic business paradigm. The three Academic Disciplines shown below will account for nearly one-third of all IT employees in the near future. Compared to historic computer-based application development and operating systems curricula, this marks an additional demand for program offerings by academic institutions.

	Percent of IT Employment			
	Midwest Study		Greater Omaha Study	
Academic Discipline	2002	In 5 Years	1999	In 5 Years
Telecommunications	9.4	9.7	8.5	9.6
Networking (LAN/WAN/IP)	11.7	12.4	8.8	10.5
E-commerce	8.0	9.1	4.1	12.1
Totals	29.1	31.2	21.4	32.2

Ten years ago, much of the content and subjects implied by these three Academic Disciplines did not exist in the industry, and, if they existed, most schools did not have curricula offerings. This rate of growth for new specific disciplines within the IT professional community has probably never been witnessed before. It reflects profound changes in the nature and character of the IT profession and the business expectations for Information Technology within the business community.

Firms were also asked to rank the importance of 48 Applied Areas. These Applied Areas are equivalent to courses that might be offered within a given Academic Discipline. The weighted score for all 48 Applied Areas was 2.09 for the 124 Midwestern firms and 1.71 for the Greater Omaha firms.

Reflecting very similar requirements, 15 of the 22 highest ranked Applied Areas for the Midwestern firms were identical to the 18 highest ranked Applied Areas for the Greater Omaha firms. This very high consistency also suggests that curriculum requirements of business are largely the same no matter the geographical location, size, and/or nature of the business of the firm.

Conclusions

In summary:

- Fifteen Applied Areas were ranked most important in both studies.
- Seven high scoring Applied Areas were unique to the smaller Midwestern firms.
- Three high scoring Applied Areas were unique to the larger Greater Omaha firms.
- Data, Telecommunications, Client Server, and E-commerce were the highest scoring technology areas.

Profound and Dramatic Change

The major story in these two studies is not the high degree of similarity or apparent inconsistencies between rural and urban employers. These two studies document, in many respects, the similarity of demand for educational services during a time of profound and dramatic change in the way businesses view their organization, market, products, competition and processes. No matter the size, location or type of business, Information Technologies are changing the business world.

Because of the World Wide Web, it is hard to identify a firm that has not or will not change their view of:

- Their product or service offering
- Their market
- Their method of sales
- Their customer relationships
- Their supplier relationships
- Their pricing
- Their business

In the public policy arena:

- New businesses relocating to a region want assurances of no tax on E-sales. If assurances cannot be given, they will move their server.
- Geography and distance will become less important.
- Copyright, patent, signature verification, law, ethics, privacy, etc. are in uncharted waters.

In the emerging E-world, the relevance of IT has changed profoundly. For many firms and industries, Information Technology was an important “operational issue.” The MIS department had to be soundly and efficiently run. Local and wide area networks were used to link all computerized workstations, providing accurate networks and systems essential to sound operations in the enterprise. The business is increasingly reliant on a stable electronic platform from which to run corporate operations.

For many firms, however, Information Technology has moved from an “important operational” issue to a “strategic issue.” In firm after firm, successful strategic use of

computer networked, Web-based technology has created enormous opportunity, for both efficient internal operations and restructuring service offerings, reaching back to suppliers and out to customers. In many cases, operating costs were sharply reduced while restructuring the industry. Ameritrade and stock transactions are examples as are Amazon.com and the restructuring of book, CD and toy sales, delivery of educational content, etc.

The catalog industry has moved to Web technologies very quickly. Research of any kind – consumer, business, academic, etc. – is now most productive on the Web. Web-based recruiting, real estate, and auto sales are affecting newspaper strategies, trucking and transportation logistics are being redesigned around GPS and other technologies. The list goes on.

Never has there been, in such a short time, such a profound and dramatic change in the way business views their organizations, markets, products and processes!

As all Information Technology disciplines have become more important, it has been nearly impossible for the academic community to respond with the programs and curriculum to meet the changing needs of employers. Unfortunately, there appears to be no slowing in the rate of change so college and university curriculums will be under intense pressure for years to come. These fast paced changes in business requirements will increasingly be at odds with the more deliberate rate of change in some colleges and universities.

Finally, employers' views of staffing may also change. More firms may embrace a "buy" strategy to staff fast changing business requirements. This argument is best expressed in a recent Department of Commerce publication.

> *As time has become an increasingly important factor of competitiveness for many employers of IT workers, the time available to retrain existing employees or train new employees in the skills needed for new projects has diminished.*
>
> *In this environment, many companies have concluded that they cannot afford the time penalty and the uncertainty associated with "making" the employees they need (through training or retraining) and are, instead, pursuing a "buy" strategy, seeking the exact skills and experience they need for a particular project and paying a premium for it. Or, as reported by the Gartner Group, "the pace of technological change is making the outside market the best source and repository of intensive technology skills."*[1]

This trend is likely to further intensify the business demand for specific technical competencies. That demand is also likely to result in different and changing expectations from college and university curriculums.

[1] Source - The Digital Workforce: Building Infotech Skills at the Speed of Innovation; U.S. Department of Commerce, Office of Technology Policy; June, 1999

Appendix A

Survey Participants - 2002 Midwestern Survey

Advanced Computer Services
Affiliated Foods
All Power, Inc.
ALLTEL
AmFirst Bank, N.A.
Applied Engineering, Inc.
Airwave Wireless Communications
Avera St. Anthony's Hospital
Becton Dickinson
Besser Sioux City
Blue Cross Blue Shield of North Dakota
Brooks Law Offices, P.C.
Brown & Saenger
Bureau of Reclamation
Central Nebraska Medical Clinic, P.C.
Chase County Community Hospital
Citibank
City of Fergus Falls
City of McCook
City of Ogallala
City of Scottsbluff
CNH
Community Hospital – McCook
Connecting Point
Connecting Point Technology Center
Copycat Printing
Corporate Technologies
D.T.S., Inc.
Dacotah Paper Co.
Database By Design
DeLong Sportswear
Duncan Aviation
Education Service Unit #13
Education Service Unit #15
Enterprise Solutions, Inc.
Farm Credit Services of America
Farmers Cooperative Association
Farmers State Bank
First National Bank
First National Bank of Omaha
FM Accoustical Tile, Inc.
Freeman
Frenchman Valley Farmers Cooperative, Inc.
Frontier
Gering Public Schools
GSG Foodservice
Great Plains Capital
Greater Omaha Chamber of Commerce
Hansen Manufacturing Corp.
Hemingford Cooperative Telephone Co.
Heritage Group
Hiland-Roberts, Inc.
Hi-Line Cooperative, Inc.
Holiday Inn Express
Hornady Manufacturing Company
Information Analytics
KDUH Television
Keith County
KELN-FM/KOOQ-AM
Kildore Lumber Co.
Kircher & Associates Reality, Inc.
Kolberg Pioneer, Inc.
Lisle Corporation
McCook Area Chamber of Commerce
McCook Clinic, P.C.
McCook Daily Gazette
McCook Eye Clinic, P.C.
McCook National Bank
McCook Public Schools
McPherron Skiles Joel & Loop
Memorial Health Center
Mid-Plains Community Area
Miller, Neidhardt & Associates, P.C.
Minnesota WebWorks
NDSCS
Nebraska Air National Guard
Nebraska Public Power District
Nebraska State Patrol
NISC
Nishna Productions, Inc.
Norfolk Iron and Metal, Inc.
Nucor Steel
Omaha Public Power District
Owen Industries
Panhandle Community Services
Parker Hannifin Corporation
Pathology Services, P.C.
Perfection Learning Corporation
Phyto-Technologies, Inc.
Pinpoint
Principal Financial Group
Pro Printing
Raytheon
Red Willow County FSA
Republican Valley Motor Co.
Runge Enterprises, Inc.
Saint Francis Medical Center
Sargent Pipe Company, Inc.
Security Equipment, Inc.
Sidney Medical Associates
Southwest PPD
SRCC
State of Nebraska, Dept. of Correctional Services
TechLink
Telco Triad Community Credit Union
The Goodyear Tire & Rubber Co.
Titan Industries
Transcrypt
Union Bank & Trust
Valley Bank
Vishay Dale Electronics
Western Sugar Company
Wiedeman Financial Services, Ltd.
Workplace Technology Center
XS Consulting Group
Yellow Jacket Manufacturing, Inc.

Appendix A

1999 Greater Omaha Participants

Advanced American Technologies
Bass & Associates
Behlen Manufacturing Co.
Blue Cross & Blue Shield of NE
CalEnergy Company, Inc.
Carlson Hospitality Worldwide
Central States Health & Life Company
ConAgra Foods, Inc.
Corporate Express Doc & Print Management
CSG Systems, Inc.
Double E Computer Systems
Farm Credit Services of America
First Data Corporation
First National Bank of Omaha
Great Plains Communications, Inc.
Guarantee Mutual Life Insurance
Inacom Corporation
Kiewit Construction
KMS Associates
Kutak Rock Law Offices
Leopard, Inc.
Lyman Richey Corporation
Midwest Computer Products
Mutual of Omaha Companies
Nebraska Methodist Health Systems
Omaha Public Power District
Omaha World-Herald
Omnium Worldwide, Inc.
Oriental Trading Company
Pamida, Inc.
PlaNet 2000 Software
PKS Information Services, Inc.
Priority Technologies
Richman Gordman
St. Joseph Hospital
The Schemmer Associates
Travel & Transport
USWEST Communications
Union Pacific Railroad Co.
Valmont Industries
Word Data Business Systems
World Insurance

Participants in Both 2002 and 1999 Surveys

First National Bank of Omaha
Omaha Public Power District

1999 SURVEY OF GREATER OMAHA BUSINESS REQUIREMENTS FOR IT
COMPANY EMPLOYMENT AND EDUCATION OPERATIONS SUMMARY
GREATER OMAHA ONLY

43 FIRMS

All Greater Omaha Employees	1999	Forecast In 5 Years	Percent Change
1. Number of All Employees (Greater Omaha)	66,493	81,812	23.04
2. Number of All Employees Now Taking Academic Credit Courses	5,321		
3. Number of All Employees You Feel Should Be Taking Academic Courses	9,845		
4. Number of Those Employees Taking Academic Credit Courses Who Are on a Company Tuition Reimbursement Program:	2,496		
5. Education/Training Budget-Omaha Employers	$14,256,797	$26,063,644	82.82
Amount of Training Budget for:			
a. Internally Provided Training Programs	$ 7,529,858	$15,268,043	114.29
b. External Seminars & Workshops	$ 2,477,293	$ 3,819,479	54.18
c. Tuition & Cost for College Courses	$ 1,720,507	$ 3,604,425	109.41
d. Industry Certificates	$ 1,954,031	$ 2,802.047	43.40
e. Other	$ 574,957	$ 569,464	-0.95
Greater Omaha Information Technology Employees			
6. Number of Information Technology Employees	7,616	9,339	22.60
5. Number of Information Technology Employees Now Taking Academic Credit Courses	615		
6. Number of Information Technology Employees You Feel Should be Taking Academic Courses	1,701		
7. Number of Those I.T. Employees Taking Academic Credit Courses Who Are On a Company Tuition Reimbursement Program	323		
10. Education/Training Budget - I.T. Employees Only	$ 9,429,371	$16,272,275	72.60

Appendix B - 1999 Survey

PROFILE OF ACADEMIC DISCIPLINES FOR INFORMATION TECHNOLOGY EMPLOYEES
GREATER OMAHA OPERATIONS ONLY
43 FIRMS

Estimated Percent of Employees by Academic Disciplines

ACADEMIC DISCIPLINES	Rank Importance of Discipline to Your Firm*	% IT Employees with these Discipline 1999	%Employees with these Disciplines in 5 yrs
Electronic Engineering	2.39	1.8	1.0
Telecommunications	1.36	8.5	9.6
Systems Integration	1.13	17.2	14.6
Computer Engineering & Systems	1.72	14.2	13.8
Systems Development & Business Integration	1.05	35.7	25.5
Technology Management	1.19	7.8	8.5
Technical Marketing	2.06	1.9	2.8
E-commerce	1.25	4.1	12.1
Networking (LAN/WAN/IP)	1.11	8.8	10.5
	% Sub - Baccalaureate	41.3	38.2
	% Baccalaureate	47.6	48.3
	% Graduate	11.0	13.6

Estimated Number of Employees by Academic Disciplines

ACADEMIC DISCIPLINES	Rank Importance of Discipline to Your Firm*	# IT Employees with these Disciplines 1999	# Employees with these Disciplines in 5 yrs	Percent Change
Electronic Engineering	2.39	137	96	-29.93
Telecommunications	1.36	642	894	39.25
Systems Integration	1.13	1296	1369	5.63
Computer Engineering & Systems	1.72	1066	1290	21.01
Systems Development & Business Integration	1.05	2686	2381	-11.36
Technology Management	1.19	583	791	35.68
Technical Marketing	2.06	146	262	79.45
E-commerce	1.25	308	1126	265.58
Networking (LAN/WAN/IP)	1.11	661	979	48.11
	# Sub - Baccalaureate	3149	3565	13.21
	# Baccalaureate	3626	4506	24.27
	# Graduate	841	1268	50.77

** 1 = Most Important 4 = Least Important*

IMPORTANCE OF APPLIED AREAS

43 FIRMS

Rank Each Applied Area	*Rank of Area	**Need Met by Colleges & Univs	*** Differences
Electronic Engineering			
- Computer Systems/Architecture	2.83	3.22	0.39
- Directories, Circuits & Systems	2.51	3.19	0.68
- Comm's, Control & Signal Processing	2.60	3.19	0.59
- Other			
Telecommunications			
- Protocols, ATM, TCP/IP, Frame Relay, ADSL	1.32	2.64	1.32
- Wireless	2.08	2.69	0.61
- Telephony	1.74	2.58	0.84
- Fiber Optics	1.66	2.70	1.04
- Other			
Systems Integration			
- Software/Hardware Configuration	1.20	2.63	0.87
- LAN/WAN	1.12	2.11	0.99
- Technical Purchasing (RFI, RFP, ROI)	1.62	2.66	1.04
- Applied Mfg, Production, Operations	1.68	2.31	0.63
- Installation/Implementation	1.22	2.94	1.72
- Quality Assurance	1.39	2.27	0.88
- Other			
Computer Engineering & Systems			
- Operating Systems/Compilers/Tools	1.32	2.13	0.81
- Language/CASE	1.70	1.96	0.26
- AI/ES/Inference Engines	2.08	1.77	-0.31
- Architectures/Platforms	1.34	1.96	0.62
- Capacity and Performance Planning	1.58	2.47	0.89
- Numerical Computing, Algorithms	2.12	1.56	-0.65
- Operations Research	2.26	2.17	-0.09
- Standards/Documentation	1.61	2.46	0.85
- Other			
Systems Development & Business Integration			
- Methodology	1.61	2.24	0.63
- Data Warehousing	1.72	2.18	0.46
- Client/Server	1.38	1.94	0.56
- Business Planning/Re-Engineering	1.77	2.45	0.68
- Human Factors Engineering	2.34	2.80	0.46
- Design/Programming	1.11	1.87	0.76
- Decision Support Systems	1.75	1.81	0.06
- Other			
Technology Management			
- Project Management	1.16	2.38	1.22
- Business Planning Strategies/Tactics	1.67	2.35	0.68
- Specific Technical Competencies	1.38	2.67	1.29
- Communications Law, Regulation	2.22	2.50	0.28
- Legal/Ethical/Human Resource Mgmt.	2.14	2.37	0.23
- Technology & Social/Economic Change	2.27	2.87	0.60
- Other			

*1 = Most Important 4 = Least Important
**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.

IMPORTANCE OF APPLIED AREAS

43 FIRMS

(Continued)

Rank Each Applied Area	*Rank of Area	**Need Met by Colleges & Univs	*** Differences
Technical Marketing			
- Business Planning, Strategies, Tools	2.09	2.51	0.42
- Technical Competencies	1.82	2.49	0.67
- Marketing Concepts	2.30	2.43	0.13
- Other			
E-commerce			
- Development Technologies	1.41	2.58	1.17
- Legal/Public Policy Issues	2.15	2.74	0.59
- Business Opportunity/Risk	1.90	2.69	0.78
- Management & Control	1.74	2.69	0.95
- Security	1.28	2.92	1.64
- Other			
Networking (LAN/WAN/IP)			
- Protocols - Open and Proprietary	1.27	2.19	0.92
- Integration	1.18	2.60	1.42
- Unification, Convergence	2.15	2.66	0.51
- Servers, Bridges, Routers and Hubs	1.33	2.63	1.30
- Security Encryption	1.44	2.70	1.26
- Continuity, Interruption & Recovery	1.36	2.66	1.30
- Other			
Overall Average	**1.71**	**2.43**	**0.72**

*1 = Most Important 4 = Least Important **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.

Appendix B - 1999 Survey

RANKING* OF TECHNOLOGY AREAS
ALL 43 FIRMS

Technology Areas	*Rank 1999	In 5 Years
- Languages	1.87	1.62
- Data	1.54	1.31
- Telecommunications	1.72	1.32
- Client/Server	1.92	1.70
- Human Factors Engineering	2.39	1.84
- Educational Technologies Learning Services	2.48	1.84
- CAD/CAM/CAE	3.36	2.87
- Object-Oriented Design	2.04	2.14
- Artificial Intelligence	3.03	2.55
- Multimedia - The Technologies	2.56	1.77
- Multimedia - Presentation	2.55	2.00
- Virtual Reality	3.17	2.25

* 1 = Most Important 4 = Least Important

RANKING* OF VENDOR CERTIFICATIONS
10 FIRMS WITH LESS THAN 100 EMPLOYEES

Vendor Certifications	Now	5 Years
Microsoft	1.66	1.48
Novel	3.25	3.45
Cisco	2.48	2.56
Lotus Notes	2.49	2.49
Oracle	1.64	1.67
PowerBuilder	3.21	3.24
PeopleSoft	2.62	2.69
Cold Fusion	3.73	3.55
Other		

*Ranking 1 = Most Important 4 = Least Important

2002 SURVEY OF MIDWESTERN BUSINESS REQUIREMENTS FOR IT
124 TOTAL FIRMS REPORTING
LARGE AND SMALL FIRMS

All Employees – 124 Regional Firms	2002	Forecast In 5 Years	Percent Change
1. Number of All Employees	32,206	35,157	9.16%
2. Number of ALL Employees Now Taking Academic Credit Courses	3,618		
3. Number of All Employees You Feel Should Be Taking Academic Courses	6,826		
4. Number of Those Employees Taking Academic Credit Courses Who Are On a Company Tuition Reimbursement Program:	684		
5. Education/Training Budget	$4,522,371	$6,110,084	35.11%
Amount of Training Budget for:			
a. Internally Provided Training Programs	$ 779,384	$1,365,978	75.26%
b. External Seminars & Workshops	$1,098,268	$1,462,899	33.20%
c. Industry Certificates	$ 825,010	$1,209,012	46.55%
d. Tuition & Cost for College Courses	$ 208,775	$ 450,866	115.96%
e. Other	$ 132,950	$ 111,465	-16.16%
Information Technology Employees			
6. Number of Information Technology Employees	1,873	2,089	11.54%
7. Number of Information Technology Employees Now Taking Academic Credit Courses	187		
8. Number of Information Technology Employees You Feel Should be Taking Academic Courses	747		
9. Number of Those I.T. Employees Taking Academic Credit Courses Who Are On a Company Tuition Reimbursement Program	59		
10. Number of Information Technology Employees Now Taking Industrial Certification Courses	163		
11. Education/Training Budget - I.T. Employees Only	$1,788,063	$2,015,700	12.73%

* 73 of the 124 firms provided education/training budget information.

** 57 of the 124 firms provided information on the amounts of their training budget for items 5a-5e. Therefore, training budget items 5a-5e do not equal the total training budget.

PROFILE OF ACADEMIC DISCIPLINES FOR INFORMATION TECHNOLOGY EMPLOYEES
124 Regional Firms

Estimated Percent of Employees by Academic Disciplines

ACADEMIC DISCIPLINES	Rank Importance of Discipline to Your Firm*	% IT Employees with these Disciplines 2002	%Employees with these Disciplines in 5 yrs
Electronic Engineering	2.59	7.12	7.15
Telecommunications	1.72	9.37	9.68
Systems Integration	1.39	11.90	12.37
Computer Engineering & Systems	1.93	9.46	10.29
Systems Development & Business Integration	1.74	20.30	17.44
Technology Management	1.83	10.29	9.65
Technical Marketing	2.98	4.59	5.30
E-commerce	1.95	7.95	9.06
Networking (LAN/WAN/IP)	1.24	11.71	12.43
% Sub - Baccalaureate		40.13	30.37
% Baccalaureate		50.16	53.28
% Graduate		9.70	16.34

Estimated Number of Employees by Academic Disciplines

ACADEMIC DISCIPLINES	Rank Importance of Discipline to Your Firm*	# IT Employees with these Disciplines 2002	# Employees with these Disciplines in 5 yrs	Percent Change
Electronic Engineering	2.59	138	153	10.97
Telecommunications	1.72	182	207	14.21
Systems Integration	1.39	231	265	14.91
Computer Engineering & Systems	1.93	183	220	20.17
Systems Development & Business Integration	1.74	393	373	-5.08
Technology Management	1.83	199	207	3.61
Technical Marketing	2.98	89	113	27.42
E-commerce	1.95	154	194	26.00
Networking (LAN/WAN/IP)	1.24	227	266	17.24
# Sub - Baccalaureate		752	635	-15.55
# Baccalaureate		939	1113	18.53
# Graduate		182	341	87.36

** 1 = Most Important 4 = Least Important*

IMPORTANCE OF APPLIED AREAS

124 Regional Firms

Rank Each Applied Area	*Rank of Area	**Need Met by Colleges & Univs	*** Differences
Electronic Engineering			
- Computer Systems/Architecture	2.45	2.31	-0.14
- Directories, Circuits & Systems	3.09	2.70	-0.39
- Comm's, Control & Signal Processing	2.97	1.96	-1.01
- Other			
Telecommunications			
- Protocols, ATM, TCP/IP, Frame Relay, ADSL	1.44	2.98	1.54
- Wireless	2.27	3.30	1.03
- Telephony	1.87	2.92	1.05
- Fiber Optics	1.92	2.86	0.94
- Other			
Systems Integration			
- Software/Hardware Configuration	1.68	2.75	1.07
- LAN/WAN	1.39	2.83	1.44
- Technical Purchasing (RFI, RFP, ROI)	2.71	2.88	0.17
- Applied Mfg, Production, Operations	3.38	1.67	-1.71
- Installation/Implementation	2.41	2.61	0.20
- Quality Assurance	1.61	3.05	1.44
- Other			
Computer Engineering & Systems			
- Operating Systems/Compilers/Tools	2.17	2.53	0.36
- Language/CASE	2.18	1.63	-0.55
- AI/ES/Inference Engines	3.16	2.65	-0.51
- Architectures/Platforms	1.76	2.80	1.04
- Capacity and Performance Planning	2.01	3.01	1.00
- Numerical Computing, Algorithms	1.97	2.08	-0.89
- Operations Research	2.84	2.90	0.06
- Standards/Documentation	1.75	2.70	0.95
- Other			
Systems Development & Business Integration			
- Methodology	1.97	3.03	1.06
- Data Warehousing	1.76	2.75	0.99
- Client/Server	1.77	2.19	0.42
- Business Planning/Re-Engineering	2.16	3.05	0.89
- Human Factors Engineering	2.28	3.12	0.84
- Design/Programming	1.49	2.24	0.75
- Decision Support Systems	1.83	2.72	0.89
- Other			
Technology Management			
- Project Management	1.79	2.82	1.03
- Business Planning Strategies/Tactics	2.13	3.12	0.99
- Specific Technical Competencies	2.17	3.08	0.91
- Communications Law, Regulation	2.20	2.89	0.69
- Legal/Ethical/Human Resource Mgmt.	2.06	2.44	0.38
- Technology & Social/Economic Change	2.10	2.42	0.32
- Other			

*1 = Most Important 4 = Least Important
**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.

IMPORTANCE OF APPLIED AREAS

124 Regional Firms

(Continued)

Rank Each Applied Area	*Rank of Area	**Need Met by Colleges & Univs	*** Differences
Technical Marketing			
- Business Planning, Strategies, Tools	2.61	2.65	0.04
- Technical Competencies	2.49	2.21	-0.28
- Marketing Concepts	2.68	2.24	-0.44
- Other			
E-commerce			
- Development Technologies	1.75	2.24	0.49
- Legal/Public Policy Issues	2.26	2.72	0.46
- Business Opportunity/Risk	2.26	2.76	0.50
- Management & Control	2.08	2.66	0.58
- Security	1.36	3.09	1.73
- Other			
Networking (LAN/WAN/IP)			
- Protocols - Open and Proprietary	1.92	3.01	1.09
- Integration	1.60	3.05	1.45
- Convergence	1.62	3.12	1.50
- Servers, Bridges, Routers and Hubs	1.38	3.02	1.64
- Security, Encryption, Firewalls	1.31	3.23	1.92
- Continuity, Interruption & Recovery	1.31	3.31	2.00
- Other			
Overall Average	**2.09**	**2.71**	**0.62**

*1 = Most Important 4 = Least Important
**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 AREAS

124 Regional Firms

Technology Areas	Rank* 2002	In 5 Years
- Languages	2.22	2.14
- Data	1.67	1.28
- Telecommunications	1.46	1.36
- Client/Server	1.99	1.37
- Human Factors Engineering	2.42	1.99
- Educational Technologies/Learning Services	2.45	2.51
- Electronic Commerce	1.82	1.96
- CAD/CAM/CAE	2.96	2.65
- Object-Oriented Design	2.21	2.39
- Artificial Intelligence	3.18	2.51
- Multimedia - The Technologies	2.53	2.14
- Multimedia - The Presentation	2.35	2.37
- Virtual Reality	3.16	3.06

* 1 = Most Important 4 = Least Important

IT CERTIFICATIONS

124 Regional Firms

Rank Each Certification	*Rank 2002	5 Years
Vendor Certifications		
- Microsoft	2.81	2.34
- Novell	3.45	3.38
- Lotus Notes	3.64	3.58
- Cisco	2.84	2.42
- Oracle	3.17	2.80
- PeopleSoft	3.82	3.67
- Linux	3.88	3.24
- Other		
Technologies		
- WAN/LAN	2.08	1.88
- TCP/IP	2.07	1.97
- VPN	2.88	2.01
- Wireless	2.67	1.85
- Other		
Professional/Other		
- Project Management (PPM)	2.56	1.27
- Security (SANS/ CISSP)	2.19	2.09
- Disaster Planning & Recovery	2.55	2.11
- A+	2.75	2.75
- Net+	3.13	3.21
- Other		
Programming & Development		
- XML	3.48	2.96
- Java/ JavaScript	3.38	2.83
- HTML	3.22	2.65
- C++	3.28	3.00
- Visual Basic	3.37	2.96
- Other		
Database		
- Oracle	2.51	2.22
- SQL	2.21	2.09
- MS-SQL	2.75	2.54
- SQL Server	2.58	2.56
- DB2	2.84	2.52
- Crystal Reports	3.39	3.20
- Other		

*1 = Most Important 4 = Least Important

124 Regional Firms

Rank Each Applied Area	*Rank of Area
Rank Responsiveness of Area Initiatives in Meeting Your Firm's Educational Needs in IT	
- Private Trade Schools	2.27
- Community College/Technical Institute	1.76
- 4-Year Colleges & Universities	1.81
How Prepared Are Graduates to Meet Your Firm's Job Requirements	
- Private Trade Schools	1.88
- Community College/Technical Institute	1.79
- 4-Year Colleges & Universities	1.82

* 1 = Very Responsive 3 = Seldom Responsive