

Greater Omaha Business Requirements for Educational Services in Information Technology

A report compiled by the
Applied Information Management Institute



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Executive Summary

A survey of Greater Omaha business requirements for educational services in information technology was completed by the Applied Information Management (AIM) Institute.

The survey included 62 area firms with total employment of nearly 53,000 employees. This represents over 14.1% of the Omaha Metropolitan Statistical Area (MSA) non-farm employment.

Information technology employees totaled 6,877 or 13% of all employees in responding firms. Other significant number include:

- 8% or 4,226 of all employees from responding firms are currently taking academic courses.
- 70% of employees taking academic courses are in tuition reimbursement programs.
- Total training budgets for the 41 firms reporting these data were over \$30 million now and projected to approach \$46 million in five years.
- For firms reporting these data, the per-employee training cost is:

	1995	Five Years
All Employees	\$ 742	\$1,015
IT Employees	\$1,382	\$1,761

The proportion of employees with sub-baccalaureate degrees was 58%. This very large sub-baccalaureate employment documents, in part, the continued tight labor market in the metropolitan area. Many firms would like to implement higher academic standards for new employees but there are not sufficient numbers of potential new employees with those qualifications. These employees create a large potential market for future additional academic courses/degrees programs.

	1995	Five Years
Sub-baccalaureate	58%	51%
Baccalaureate	35%	39%
Graduate	7%	10%

Firms ranked the importance of seven Academic Disciplines and the 37 Applied Areas within those disciplines. The following shows that the top priorities concentrate into two major areas:

- the technology and applications that run on the emerging client/server, local and wide area networked platforms; and
- the business planning strategies/tactics, re-engineering, project management and technical management of information technologies within the firm.

Most Important Academic Disciplines and Applied Areas

Telecommunications

- LAN/WAN Networks, Architecture Design, Management

Systems Integration

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

Systems Development & Business Integration

- Methodology
- Client/Server
- Business Planning/Re-engineering
- Design/Programming

Technology Management

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

And, within these Disciplines and Applied Areas, topics that are important today with increasing importance in five years were:

- Data
- Telecommunications
- Client/Server Environments
- Electronic Commerce
- Multimedia Presentation

Other significant findings show that:

- Expenditures for training and education will increase (51%) faster than employment (10.4%).
- Firms will increase internal training budgets and tuition budgets relatively faster than internally provided programs.
- IT professional positions will grow more rapidly (27%) than for all employees (10.4%).
- Electronic Engineering is part of the intellectual foundation of most information technologies and will be important to selected re-energized IT curriculums.
- The number of new IT graduates from all area colleges and universities will fall far short of the demand for such employees in the foreseeable future.

B. Recommendations

1. 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 university partner.

- Further defining specific needs in the new Academic Disciplines and Applied Areas listed as most important in this study. This work should be done in close consultation with the academic community.
 - Working with colleges and universities to develop creative programs that attract more students into all area IT programs. The object is to close the gap between the growth in demand of IT professionals and the number of new graduates.
2. Colleges in the area, including UNL, UNO, Metro, Bellevue, College of St. Mary, Creighton and Iowa Western may wish to:
- Develop areas of specialization with the greatest concentration of senior faculty research and teaching positions in that specialization. (The range of topics is so broad, no college or university will be able to develop quality programs in all disciplines.)
 - Develop high quality and comprehensive baccalaureate and graduate programs in:
 - Telecommunications
 - Client/Server – LAN/WAN
 - Project Management/
 - Technology Management
 - Multimedia
 - Electronic Commerce
 - Develop techniques to allow greater mobility of academic resources and collegial partnerships across campus boundaries to match the convergence of technology and related applications in industry.
 - Tightly align electronic engineering programs with IT to create the intellectual capital required by the integration and convergence of information technologies now underway.
 - Support the continued integration of IT into structures, machines, devices and processes to create the logical marriage of multiple engineering disciplines and IT.
 - Consolidate and refocus IT and related academic resources that may be spread across the institution.
 - Develop incentives to encourage faculty training and re-training in emerging IT disciplines.
 - Develop creative course structures and marketing programs that target non-traditional students with sub-baccalaureate degrees who are employed by firms with tuition reimbursement programs.
 - Establish techniques to partner with business for teaching labs – both hardware and software – that are productive to both partners.
 - Develop courses and research related to electronic commerce.

Background

Information Technology is essential to the growth of business and industry in the Greater Omaha/Nebraska region. Information Technologies (IT) are increasingly becoming the platform on which business and commerce depend. These technologies:

- are the electronic platform for communication and business transactions across the firm and industry, reaching out to customers and back to suppliers;
- are the basis for an increasing array of unique technology-based goods and services;
- give access to national and global markets; and
- control processes and systems.

Essential ingredients to a productive IT environment include both:

- a robust technical infrastructure, plus
- an experienced, well educated and adequate labor pool.

The physical and business infrastructure in Greater Omaha is largely adequate. The robust communications infrastructure and the growing number of suppliers in the metropolitan area are well documented. The array of hardware, software, environmental, consultative, training and service businesses in the community are highly competent and their numbers and quality exceed most areas of this size.

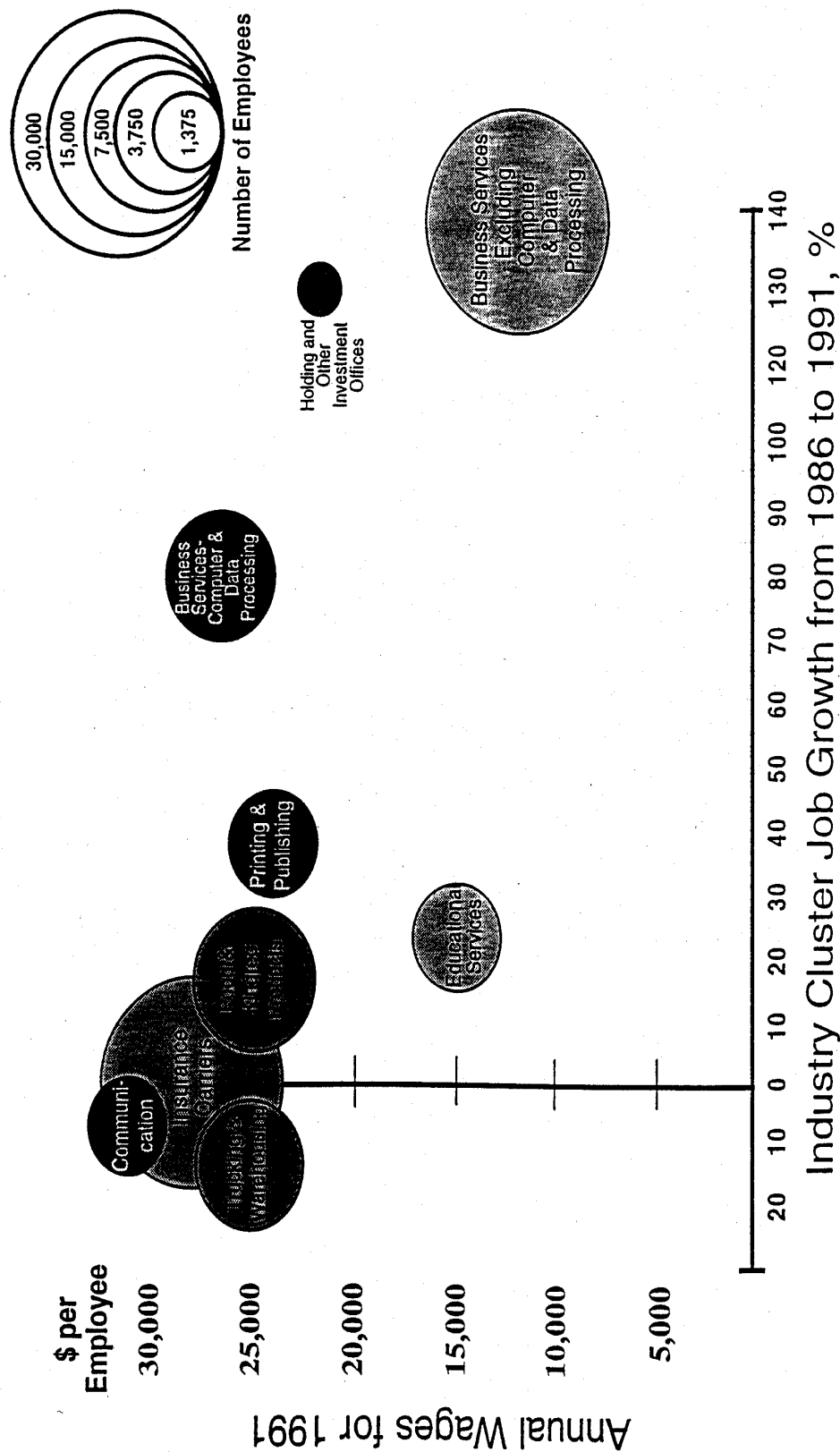
In addition, the region has produced numerous entrepreneurs that have created successful businesses and industry clusters around reservation systems, in- and out-bound telemarketing, credit card transaction processing, billing services, electronic banking services, security and the integration of IT into physical structures and mechanical devices. These firms are now shaping the growth of Greater Omaha employment as shown in Figure 1.

The Greater Omaha labor market has many favorable attributes including its work ethic, general education levels, etc.

The labor supply, however, presents a persistent challenge. The labor supply is very tight. Omaha's unemployment rate has been 3.0% or lower throughout the decade of the 90s. The May 1995 unemployment rate of 2.4% for the Omaha Metropolitan Statistical Area (MSA) is one of the lowest in the nation. Appendix A documents some reasons for that low level and suggests that there is little short-term relief short of a major economic downturn.

More specifically, the shortage for IT professionals is even more critical. Internal growth rates of existing companies create a demand for IT professionals that exceeds their supply. This internal demand is driven by the normal business growth plus an increasing percent of all jobs within firms that require IT training to perform expected job functions.

Figure I
Employment Landscape, Omaha, Nebraska



Source: SRI, Greater Omaha Chamber of Commerce

A historic supply for new entrants into IT professional positions has been new graduates from area colleges and universities. Data from the University of Nebraska-Lincoln, Iowa Western Community College and the five Omaha postsecondary academic institutions suggest that the annual total number of 300-325 IT graduates for 1993 and 1994 is falling woefully short of the estimates of over 1,000 new IT employees required by local business. Data from all Nebraska postsecondary institutions show the number of IT graduates statewide was only 678 in fiscal '93-94.

In addition to the numerical shortfall, this study will document courses and curriculums from local institutions frequently do not include the content desired by many area firms.

To help bring a sharper focus on business needs, the Applied Information Management (AIM) Institute has completed an extensive study of business IT requirements. The following summarizes the findings of this study. The results are designed to provide an informed and documented statement of need to academic institutions. It will also be instructive in helping area businesses evaluate their operations and focus their expectations from local educational providers.

A. Study Methodology

The study was directed by a Curriculum Council composed of senior IT business managers from Omaha businesses. A questionnaire was designed to document Omaha firms' present and future requirements for employment, training budgets and curriculum. These questionnaires were mailed to Greater Omaha employers that are technology providers or users.

The results likely understate the number of IT professionals because most firms reported only their MIS employees as professionals. This reporting may understate IT training, marketing, factory floor or other departmental professionals. The results also understate training budgets. Only 41 of the 62 survey respondents provided these data and many of those reporting stated they were incomplete budgets.

Focus groups composed of corporate managers were held to react to the preliminary findings. These focus groups also identified educational delivery strategies and identified high-priority areas for advanced degrees.

Survey responses were received from employers with nearly 53,000 employees, or 14.1% of all Omaha Metropolitan Statistical Area (MSA) non-farm employment. Respondents included 35 employers with employment over 100 and 27 small firms with fewer than 100 employees. Appendix B includes the list of respondents. Appendix C shows the composite averages and totals by size of firm for each question.

Findings

A. Employment and Training Budgets

1. Corporate Employment

Survey forms were completed by 62 firms including 35 with Omaha employment over 100 and 27 smaller firms with employment less than 100.

Survey results represent firms with 52,679 employees or over 14.1% of the Omaha MSA non-farm employment.

During the next five years, employment is expected to exceed 58,100 - a 10.4% growth.

4,226 or 8% of present employees are currently taking academic courses for credit.

70% of these employees were on company tuition reimbursement programs.

Firms believed that nearly 1,300 additional employees should be taking academic credit courses or 30% more than now enrolled in such programs.

2. Corporate Training Budgets

41 of the respondents reported their training budgets. The total training budgets for these firms was nearly \$30,361,000 or \$742 per employee.

These training budgets are projected to increase over 50% to \$45,695,000 in five years, or \$1,015 per employee.

Today, 45% of that budget is used for internally provided training with the balance going to external seminars and workshops (42%), college tuition (12%), and other (2%).

In five years, internal training budgets will increase in dollar amounts but drop to 38% of the total training budget while seminars and workshops increased to 45%, tuition for college courses increases to 16%, and other drops to 1%.

Budget projections over the next five years for college tuition more than doubles, up more than any other category.

3. Small Firms

Training budgets per employee for the 16 small firms reporting this data are \$450 and projected to be \$568 in five years – somewhat below their larger counterparts. (Not all small firms reported training budgets.)

8% of these employees are enrolled in academic credit courses – comparable to large firms.

4. IT Employment - All Firms

IT employees compose 11.5% of all employees compared to 13.1% in five years.

The five-year growth in IT employees is projected at 22.6% compared to 23.0% for all employees.

Total training budgets for small firms reporting these data are expected to grow 153% in five years.

5. IT Training Budgets - All Firms

Total IT training budgets for the 41 firms reporting these data were \$9,231,100. The five-year IT training budgets are projected at \$14,743,000, an increase of 59.7%.

For firms reporting the data, IT training averaged \$1,382 per employee and is projected to increase to \$1,761 in five years. While IT employees account for 13% of all employees, IT accounts for 30% of the training budgets. That is expected to grow to over 32% in five years.

6. Small Firms

IT employees account for 51% of all employees – far greater than for large firms.

87% of the total training budget for these small firms goes to IT training.

For the 16 small firms reporting the data, IT training expenditures average \$1,088 and are expected to increase to \$1,925 in five years. This per capita training is comparable to all firms.

B. Academic Disciplines

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

In this survey seven academic disciplines were considered. These disciplines included:

- Electronic Engineering
- Telecommunications
- Systems Integration
- Computer Engineering and Systems
- Systems Development and Business Integration
- Technology Management
- Technology Marketing

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. *Systems Integration* is an example.

The survey data suggest that corporate employment in all Academic Disciplines is expected to grow over the next five years.

1. 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 (usually the Math Department)

In the Omaha metropolitan area, most programs have a strong business or liberal arts heritage. The survey results assign high rank to many technical disciplines, which are not now available in the community. The business community seems to be saying we need engineering disciplines in our programs even though we need only modest number of electronic engineers (150 growing to over 200 in five years).

Figure 2 illustrates an emerging professional position. Business needs *Electronic Engineering* disciplines that are integrated with other disciplines to meet the rapidly growing requirements for technical skills and a business perspective.

A parallel study of engineering firms documents a further demand for electrical engineers with degrees. These two different but highly compatible markets create a substantial demand for an electronic engineering curriculum in the metropolitan area.

2. Telecommunications

Much of the Omaha business community has a strong telecommunications requirement. Local industries with global markets have capitalized on the strong local telecommunications infrastructure. The virtual absence of strong baccalaureate and graduate programs in telecommunications suggests that college and university courses and programs have significantly lagged community demand.

Large and small firms both ranked *Telecommunications* high. Total employment is nearly 9.6% of the IT professionals. More importantly, a strong set of telecommunications courses is required to round out the academic programs of many IT majors.

	Small	Large	Total
Rank	2.08	1.84	1.93
<i>Rank 1=Most Important 4=Least Important</i>			

3. Systems Integration

The much-discussed convergence of IT disciplines such as computers, video, telecommunications, wireless, TV, performing arts, etc., is well documented. In addition, the integration of IT into structures, machines, devices and processes is accelerating.

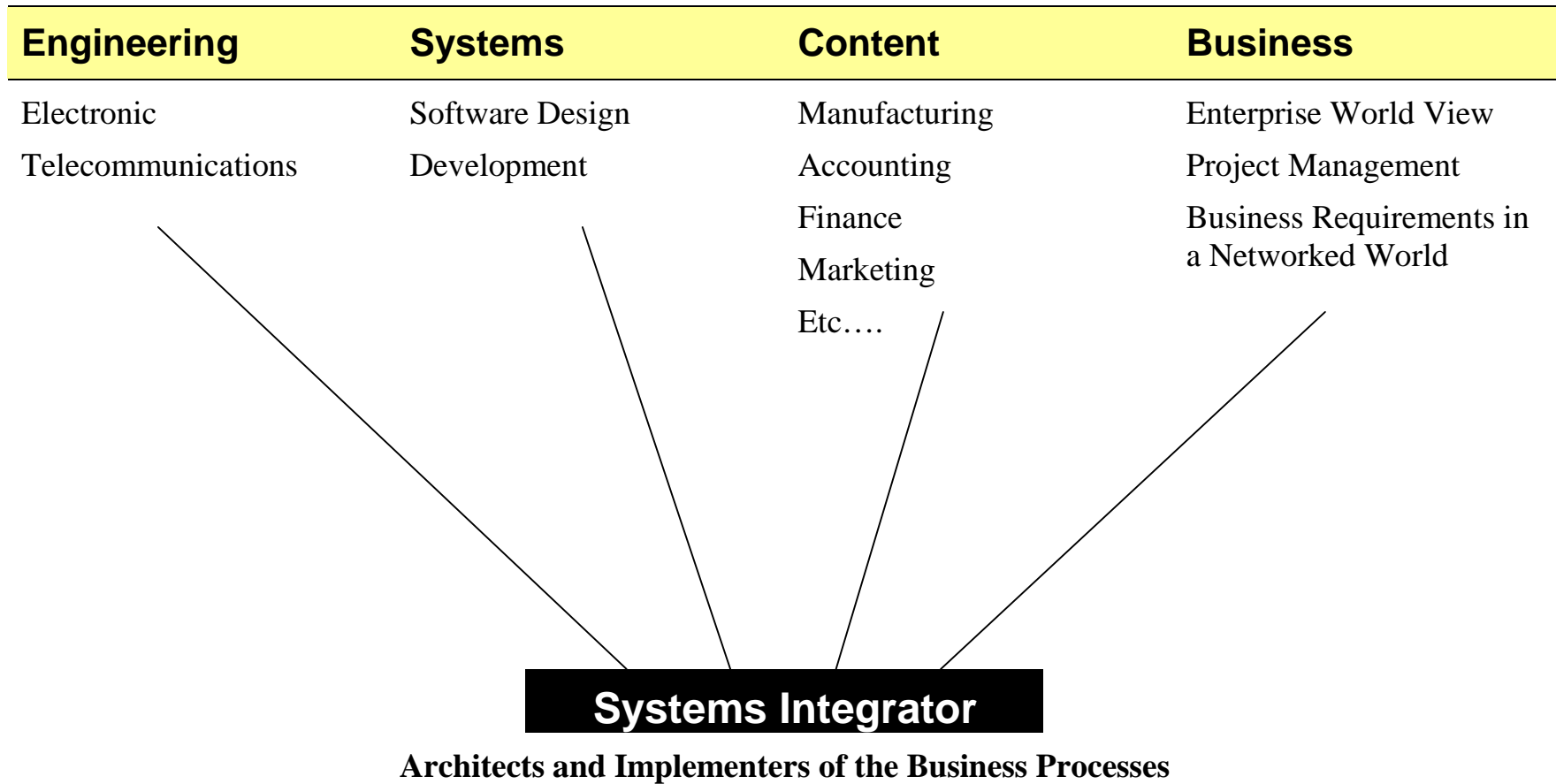
The integration of converging technologies takes place at two applied levels:

1. The hardware platforms including integration into physical structures and devices.
2. Applications that transcend all levels of activity within the firm plus access to its suppliers and customers.

Figure 2

An Emerging Employee: “The Systems Integrator”

Intellectual Roots:



The survey's use of *Systems Integration* captures the essence of that integration across multiple technologies such as computers, telecommunications, etc., plus into structures and devices. This activity consumes increasing amounts of corporate energy but no organized academic disciplines exist in Omaha postsecondary institutions (or anywhere in the U.S.) around this topic.

Systems Integration was ranked very high by large firms.

	Small	Large	Total
Rank	2.12	1.39	1.72
<i>Rank 1=Most Important 4=Least Important</i>			

4. Computer Engineering & Systems

The relatively low priority and slow growth of *Computer Engineering and Systems* appears to reflect shift to client/server technologies. Historically, topics in this discipline at local colleges and universities have had a pronounced mainframe focus.

5. 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 development topics. These programs, however, frequently have not embraced the broader issues associated with the changing platforms and their impact on systems development.

Systems Development and Business Integration ranked as second and first priority for small and large firms, respectively.

	Small	Large	Total
Rank	2.08	1.23	1.59
<i>Rank 1=Most Important 4=Least Important</i>			

It is the largest current and future component of the IT employment pool, accounting for about 40% of all jobs.

6. Technology Management

Technology Management represents a growth discipline in which college and university programs are lagging business demand.

Both large and small firms ranked *Technology Management* as very important.

	Small	Large	Total
Rank	2.04	1.77	1.88
<i>Rank 1=Most Important 4=Least Important</i>			

Technology Management accounted for nearly 10% of all IT employment.

7. Technical Marketing

Technical Marketing professionals accounted for nearly 9% of IT employment. No program that focuses on *Technical Marketing* exists in the metropolitan area.

8. Degree Levels

For all firms, the current number of sub-baccalaureate employees is nearly 58% of the IT employment.

The very large sub-baccalaureate employment documents, in part, the tight labor market in the metropolitan area. Many firms would like to implement higher academic standards for new employees, but there are not sufficient numbers of new employees with those qualifications available.

Small firms employ proportionately higher percentages of individuals with baccalaureate and graduate degrees.

Current Percent of IT Employees by Firm Size			
	Small	Large	All Firms
Sub-baccalaureate	16%	60%	58%
Baccalaureate	51%	33%	35%
Graduate	33%	7%	7%

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

Baccalaureate and graduate degrees will account for a somewhat higher percent of the future employee pool.

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. Values reported are the simple averages of all respondents.

Small/large firm comparisons were relevant in the Applied Areas just as they are for Academic Disciplines. Generally, large firms ranked most Applied Areas as more important than smaller firms. A significant exception to that pattern were Applied Areas within the *Technical Marketing* discipline.

1. Needs Met by Area Colleges and Universities

It is interesting to note that the average score for all Applied Areas was 2.16 for large firms and only 2.53 for small firms. The large firms seem to view this array of 37 topics more importantly than their smaller counterparts. Meanwhile, the large firms judged area colleges somewhat more harshly (2.75) than did the smaller companies (2.54).

Average Rank of All 37 Applied Areas			
	*Importance to Your Firm	**Needs Met by Area Colleges & Universities	Average Difference
Small Firms	2.53	2.54	0.01
Large Firms	2.16	2.75	0.59
All Firms Average	2.32	2.67	0.35

Rank 1=Most Important 4=Least Important

a. Large Firms

There were only three Applied Areas in which large firms considered their needs were being met by area colleges and universities:

- Directories, Circuits/Architecture
- Communications, Control and Signal Processing
- Numerical Computing/Algorithms

These Applied Areas, however, were ranked as the three least important by the large firms with scores of 3.31, 3.03, and 3.10 respectively.

Conversely, the greatest gap between firms' needs and college and university performance is in areas ranked important by the firms, including:

- LAN/WAN Networks, Architecture Design, Management
- Telephony
- Software/Hardware Configuration
- (System Integration of) LAN/WAN
- Installation/Implementation
- Quality Assurance
- Capacity and Performance Planning
- Data Warehousing
- Client/Server
- Project Management
- Specific Technical Competencies

The large firms ranked the above Applied Areas between 1.33 and 1.90

These results suggest the Academic Areas most important to large firms are the areas where local colleges and universities are least successful in meeting these firms' needs.

b. Small Firms

The small firms, however, recorded an 18/19 split on how well area colleges and universities meet their needs in the 37 Applied Areas. Of the 22 highest-ranking Applied Areas considered most important by all firms (Table 1), however, in 16 of those areas, the small firms indicate area colleges are not meeting their needs effectively.

2. Applied Areas

Ranking for the Applied Areas was also 1 to 4; a score of 1 could be reached only if every respondent ranked a topic number 1. The highest ranked Applied Area was *Project Management*, with a composite score from all firms of 1.47. This score suggests a very large number of number 1 rankings. Low-ranking scores over 3.00 were recorded by all firms for only five Applied Areas.

It is interesting to note that *Project Management* was ranked as the second most important Applied Area by large firms (1.36) and most important by small (1.62) firms.

Table 1 documents 22 Applied Areas that were scored between 1.00 and 2.00 by either large OR small firms. A review of these Applied Areas suggests three major groupings that are important to business:

- the emerging *Client/Server, Networked Platform, Data* and the applications that will run on that platform;
- the *Business Planning/Re-Engineering, Project Management, Technical Management* and *Quality Assurance* associated with *Installation/Implementation* and maintenance of these hardware and application environments;
- the *Operating Systems, Tools, Languages, Methodologies, Standards, Documentation, etc.*, associated with both the historical mainframe environments and the emerging platforms.

The strength of the scoring in these disciplines, particularly by the large firms (which account for nearly 95% of the IT employment for all responding firms) may be of great interest to area academic institutions. While individual courses are taught in many of these areas, there is no major and comprehensive program in the metropolitan region for telecommunications, systems and business integration, project management, client/server and the implied related technologies.

To bring the Applied Areas into an even sharper focus, Table 2 shows only the Applied Areas with an average score between 1.00 and 2.00 by all firms in the study. This table documents eleven Applied Areas that would yield the highest interest in strong academic programs.

In this reduced subset, the focus is much sharper on:

- the emerging *Client Server, Networked Platforms, Methodology, Specific Competencies* and the applications that will run on that platform, and
- the *Business Planning/Re-engineering, Project Management, Business Planning Strategies/Tactics, Technical Management* and *Quality Assurance* associated with implementing and maintaining these environments.

Table 1
Applied Areas Ranked between 1.0 and 2.0 by Either Small or Large Firms
Compared to Needs Met by Colleges and Universities

Academic Discipline Applied Area	Rank* of Discipline		Rank* of Applied Area		Needs Met** by Area Colleges & Universities All Firms
	Small Firms	Large Firms	Small Firms	Large Firms	
Electronic Engineering	3.20	2.97			
Telecommunications	2.08	1.84			
• LAN/WAN Networks, Architecture Design, Management			1.92	1.52	2.66
• Telephony			2.57	1.87	2.82
Systems Integration	2.12	1.39			
• Software/Hardware Configuration			1.76	1.38	2.51
• LAN/WAN			2.08	1.44	2.61
• Installation/Implementation			2.46	1.69	2.70
• Quality Assurance			2.36	1.69	2.74
Computer Engineering & Systems	2.27	1.87			
• Operating Systems/Compilers/Tools			2.56	1.85	2.35
• Language/Case			2.96	2.00	2.51
• Capacity & Performance Planning			2.67	1.90	2.82
• Standards/Documentation			2.58	2.00	2.76
Systems Development & Business Integration	2.08	1.23			
• Methodology			2.29	1.67	2.43
• Data Warehousing			2.60	1.76	2.83
• Client/Server			2.00	1.33	2.43
• Business Planning/Re-engineering			2.17	1.87	2.66
• Design/Programming			2.35	1.52	2.15
• Decision Support Systems			2.36	1.80	2.49
Technology Management	2.04	1.77			
• Project Management			1.62	1.36	2.59
• Business Planning Strategies/Tactics			1.79	1.82	2.64
• Specific Technical Competencies			2.09	1.88	2.73
Technology Marketing	2.80	2.64			
• Business Planning, Strategies, Tools			1.78	2.26	2.67
• Technical Competencies			1.95	2.38	2.59
• Marketing Concepts			2.14	2.87	2.77

*Rank 1=Most Important 4=Least Important

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

Table 2
Highest Ranked Academic Areas by All Firms
Compared to Needs Met by Colleges and Universities

Academic Discipline Applied Area	Rank* of Discipline All Firms	Rank* of Applied Area All Firms	Needs Met** by Area Colleges & Universities All Firms
Electronic Engineering	3.07		
Telecommunications	1.93		
• LAN/WAN Networks, Architecture Design, Management		1.69	2.66
Systems Integration	1.72		
• Software/Hardware Configuration		1.5	2.51
• LAN/WAN		1.72	2.61
• Quality Assurance		1.98	2.74
Computer Engineering & Systems	2.05		
Systems Development & Business	1.59		
Integration			
• Methodology		1.93	2.43
• Client/Server		1.61	2.43
• Business Planning/Re-engineering		2.00	2.66
• Design/Programming		1.86	2.15
Technology Management	1.88		
• Project Management		1.47	2.59
• Business Planning Strategies/Tactics		1.81	2.64
• Specific Technical Competencies		1.96	2.73
Technology Marketing	2.72		

*Rank 1=Most Important 4=Least Important

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

D. Technology Areas

1. General Comments

There is an array of information topics that transcend the various Academic Disciplines and Applied Areas. In many cases they are emerging issues within information processing. These Technology Areas will provide focus to any of the Academic Disciplines and Applied Areas. To illustrate, *Multimedia* has an engineering dimension to it. It is also an issue of systems integration. It will impact future systems development and will probably become very important in technology management and technology marketing issues.

Table 3 shows Technology Areas that were ranked between 1.0 and 2.0 by small and large firms today or in five years.

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

The survey results show that most of the Technology Areas, except *Languages*, will be more important in five years. These data suggest that if colleges and universities limit the scope of curriculum and academic programs, they may miss future markets.

Table 3
Technology Areas Ranked between 1.0 and 2.0
by Small and Large Firms

Technology Area	Today		In Five Years	
	Small Firms	Large Firms	Small Firms	Large Firms
Languages	2.63	1.61	2.50	1.76
Data	2.00	1.30	1.92	1.27
Telecommunications	1.72	1.52	1.50	1.39
Client/Server	1.88	1.64	1.54	1.21
Electronic Commerce	2.04	2.85	1.73	2.03
Object-Oriented Design	2.83	2.45	2.41	1.79
Multimedia-Technology	2.40	2.97	1.92	2.28
Multimedia-Presentation	2.08	2.67	1.67	2.15

*Rank 1=Most Important 4=Least Important

2. Data, Telecommunications, Client/Server

Table 4 shows composite rankings for all firms and brings these Technology Areas in sharper focus.

The highest-ranked cluster of Technology Areas was *Data*, *Telecommunications* and *Client/Server*. This cluster characterizes the rapidly emerging information processing platform for corporate America.

Highest Ranking* Technology Areas - All Firms

	Now	In Five Years
Small Firms		
Data	2.00	1.92
Telecommunications	1.72	1.50
Client/Server	1.88	1.54
Large Firms		
Data	1.30	1.27
Telecommunications	1.52	1.39
Client/Server	1.64	1.21

*Rank 1=Most Important 4=Least Important

Table 4
Highest Ranked* Technology Areas by All Firms

	Today	In Five Years
Data	1.60	1.54
Telecommunications	1.60	1.44
Client/Server	1.74	1.35
Electronic Commerce	2.52	1.91
Multimedia-Presentation	2.41	1.95

**Rank 1=Most Important 4=Least Important*

Large and small firms both had three Technology Areas as their highest ranks. It reflects a nearly universal acceptance of this environment in the past two years

The supply of skilled professionals is critically short. Retraining is a major issue. Industry-wide technical issues still must be resolved before “bullet-proof” and stable environments are definable and achievable. This creates numerous opportunities for academic study and research.

Data. Data’s very high rank documents the increasing difficulty of managing both massive amounts and a variety of data firm-wide, industry-wide and in a global networked environment.

Historically, data management has been an important academic issue. It still is, but the answers are different in an emerging client/server world with increasing amounts and types of digitized information.

Electronic Commerce. Electronic Commerce is viewed as important in the future. There are major emerging business, application and technical dimensions to this issue that are not well understood.

It should be noted that small firms ranked electronic commerce higher than large firms:

	Now	In Five Years
Small Firms	2.04	1.73
Large Firms	2.85	2.03

Rank 1=Most Important 4=Least Important

Multimedia. The results document a growing interest with these technologies.

Once again, small firms ranked both multimedia technologies and presentation substantially higher than the larger companies, perhaps reflecting the number of small Omaha firms focusing in these disciplines.

	Now	In Five Years
Small Firms		
MM Technologies	2.40	1.92
MM Presentation	2.08	1.67
Large Firms		
MM Technologies	2.97	2.28
MM Presentation	2.67	2.15
Large Firms		
MM Technologies	2.72	2.13
MM Presentation	2.41	1.95

Rank 1=Most Important 4=Least Important

E. Focus Groups

Survey respondents were asked if they would like to participate in Focus Group discussions. Focus Group meetings were held on August 25 and August 30. The agenda for these meetings included three topics:

- What is your reaction to the statistical findings?
- What delivery technologies, calendars, location, etc., would be most responsive to the needs of business and their employees?
- In which academic disciplines would you like to see master or other graduate degree offerings?

1. Survey Findings

Business participants concurred with the statistical findings of the surveys. Typical comments about the results included:

“Accurate – trends on the mark.”

“Surprised at the strong growth rates in employment and training budgets.”

“Tremendous opportunity for the academy.”

“Surprised that electrical engineering degrees were not viewed as more important.”

2. Delivery Systems

Participants in Focus Groups addressed delivery systems for IT curriculums. To successfully serve the needs of currently employed students, the Focus Group participants suggested that changes in delivery systems may be required. Certainly the traditional classroom situations are acceptable and desirable for many traditional students. Night class schedules also meet many needs. Below are some additional ideas that will meet a broader array of non-traditional student needs.

- Colleges and universities should contract with specific firms to provide more on-site courses for their employees.

- Develop a “university without walls” concept/mentality using Internet, satellite, multimedia and other learning technologies.
- Increased flexibility and ease of registration is needed.
- Develop courses and programs that are project/assignment-based rather than class hours/location-based. Self-paced studies would allow student to complete these courses/programs within general time parameters defined by the school
- Increase use of internships to provide an applied perspective. Some programs would include required internship experience for academic credit.
- Consider other classroom meeting times such as Friday/Saturday/Sunday.
- Develop business/university partnerships for labs and classrooms using business capabilities.
- Develop tightly integrated business/academic degree programs that include traditional classroom settings plus business work experiences designed to give an applied experience in each important academic discipline.
- More effectively manage change to keep courses relevant and anticipate market needs rather than a lagged response to those needs.
- Develop partnerships with business to hire uniquely qualified individuals as joint faculty-employee working for both the university and the firm.
- Develop fast-track options for courses i.e., six weeks with one three-hour meeting per week. String such courses together allowing the student to earn a certificate or degree.

3. Graduate Degrees

It was recognized by Focus Group participants that graduate level programs could not be developed and sustained for all academic disciplines. In addition to academic topics, the tone and character of graduate education was discussed. Proposals included:

- A high quality, fast-track IT masters degree fashioned after the executive MBA program concept.
- Develop a strong applied business focus rather than a theoretical emphasis to graduate programs.
- Omaha has a strong telecommunications industry. We need a strong communications graduate degree program.
- A “Technical MBA” that has a strong IT technical core wrapped into the business management core of an MBA.
- Project Management with focus on business planning and re-engineering with a technical orientation including systems and business integration.

Conclusions

The Information Technology Survey included 62 area firms with total employment of nearly 53,000 employees. This represents over 14.1% of the Omaha Metropolitan Statistical Area (MSA) non-farm employment.

IT employees totaled 6,877 or 13% of all employees in responding firms.

Other significant survey numbers include:

- 8% or 4,226 of all employees from responding firms are currently taking academic courses.
- 70% of employees taking academic courses are in tuition reimbursement programs.
- Total training budgets for the 41 firms reporting these data were over \$30 million now and projected to approach \$46 million in five years.
- For firms reporting these data, the per-employee training cost is:

	1995	Five Years
All Employees	\$ 742	\$1,015
IT Employees	\$1,382	\$1,761

Unfortunately, the study methodology will not allow use of above values to develop estimates for total community training budgets and total IT employment. In addition, with only 41 of the 62 respondents providing training budget information, the values reported will substantially understate the total training budget of the 62 survey firms.

Numerous additional conclusions are appropriate:

1. Expenditures for training and education will increase faster than employment. (Employment up 10.4% in five years with training up 50.5%.)
2. Firms will increase external training budgets (62%) and tuition budgets (103%) relatively faster than internally provided programs (29%), creating growing market opportunities for providers.
3. IT professional positions will grow more rapidly (27%) than for all employees (10.4%).
4. IT training budgets per employee are nearly double the amount for non-IT employees now and will be more than double in five years. This creates a very fast growth industry in IT professional training at all levels.
5. Most firms reported only employees in the MIS 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 professionals.

6. The strongest demand for curriculum and programs included:
 - Communications
 - Client/Server
 - Data
 - Applications that will run on that Platform
 - Plus:
 - Business Planning/Re-Engineering
 - Project Management
 - Quality Assurance
 - Technical Management to implement and maintain these environments
7. The next strongest demand included a cluster of related topics associated with both the historical mainframe environments and the emerging platforms including:
 - Operating Systems
 - Tools
 - Languages
 - Methodologies
 - Standards
 - Documentation
8. A very large potential market of non-traditional students may exist for baccalaureate-granting institutions. This market contains the over 55% of all the IT professional employees with sub-baccalaureate degrees.
9. 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.
10. Electronic Engineering is a very important part of re-energized baccalaureate IT curriculums. Electronic Engineering is a part of the intellectual foundation of most information technologies.
11. The number of new IT graduates from all area colleges and universities will fall far short of the demand for such employees in the foreseeable future.

Recommendations

1. 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 university partner.
 - further defining specific needs in the new Academic Disciplines and Applied Areas listed as most important in this study. This work should be done in close consultation with the academic community.
 - working with colleges and universities to develop creative programs that attract more students into all area IT programs. The object is to close the gap between the growth in demand of IT professionals and the number of new graduates.
2. Colleges in the area, including UNL, UNO, Metro, Bellevue, College of St. Mary, Creighton, and Iowa Western may wish to:
 - develop areas of specialization with the greatest concentration of senior faculty research and teaching positions in that specialization. (The range of topics are so broad, no college or university will be able to develop quality programs in all disciplines.)
 - develop high-quality and comprehensive baccalaureate and graduate programs in:
 - Telecommunications
 - Client/Server – LAN/WAN
 - Project Management
 - Technology Management
 - Multimedia
 - Electronic Commerce
 - develop techniques to allow greater mobility of academic resources and collegial partnerships across campus boundaries to match the convergence of technology and related applications in industry.
 - tightly align electronic engineering programs with IT to create the intellectual capital required by the integration and convergence of information technologies now underway.
 - support the continued integration of IT into structures, machines, devices and processes to create the logical marriage of multiple engineering disciplines and IT.
 - consolidate and refocus IT and related academic resources that may be spread across the institution.
 - develop incentives to encourage faculty training and re-training in emerging IT disciplines.
 - develop creative course structures and marketing programs that target non-traditional students with sub-baccalaureate degrees who are employed by firms with tuition reimbursement programs.
 - establish techniques to partner with business for teaching labs – both hardware and software – that are productive to both partners.
 - develop courses and research related to electronic commerce.

Appendix A

Partial Findings

12th Annual Midwest Conference on Business

According to the 12th Annual Midwest Conference on Business:

Labor shortages are serious and worsening for Omaha and throughout most of the U.S. for:

- Entry Clerical
- Entry Production
- Skilled Production
- Technician
- Selected Professional Specialties
 - Architects
 - Software Engineers
 - Telecommunications Engineers

Other labor source considerations were:

- Population growth of prime working-age bracket trails rate of new job formation;
- Continued net out-migration of people in last decade;
- Comparatively high labor force participation;
- Not enough new job entrants from high schools, community colleges, baccalaureate institutions, and in-migration;
- Unless a major economic downturn and/or other unforeseen events, no relief in sight.

Bureau of Labor Statistics reports nationally that:

70.9% of all firms provide training:

<50 employees = 68.9%

50-249 employees = 97.9%

250+ employees = 99.3%

Of those providing training, their reasons were:

- To provide skills specific to firm;
- To help retrain valuable employees;
- To upgrade employee skills responding to changing technology, production methods or both.

**Presence of Formal Job Skills Training in Private Establishments,
by Reason for Training and Size of Establishment, 1993**

Characteristic	Total	<50 Employees	50-249 Employees	250+ Employees
All Establishments that Provided Any Formal Job Skills Training:				
Number	2,188	192	220	44
Percent	48.6%	45.8%	85.8%	95.9%
Percent, by Reason*				
To provide skills specific to establishment	75.0%	73.4%	86.8%	87.2%
To help retain valuable employees	52.6%	50.1%	69.8%	75.8%
To upgrade employee skills in response to changes in technology, production methods, or both	53.4%	51.7%	63.5%	78.3%
Inability to hire employees with adequate skills	13.0%	12.9%	12.4%	18.7%
Requirement of law or regulation	24.6%	22.7%	37.5%	43.6%
Requirement by collective bargaining agreement	1.4%	1.1%	3.0%	9.6%
Other Reasons	6.5%	6.7%	4.5%	6.5%

**Respondents could choose more than one category*

Source: Bureau of Labor Statistics

Appendix B

Survey Participants

Acceptance Insurance Company	Nebraska Furniture Mart
Advanced American Technologies, Inc.	Nebraska Methodist Health Systems
Applied Communications (ACI/TSA)	Network Technologies
Baird Holm Law Offices	Omaha Public Power District
Bass & Associates	Omaha World-Herald
BETAC Corporation	Oriental Trading Company
Blue Cross Blue Shield of Nebraska	Packers National Bank
Central States Health and Life Company	PKS Information Services, Inc.
Creighton University	Prairie Systems
CSG Systems, Inc.	Random Access
Culver Marketing Group	Richman Gordman
First Data Corporation/Resources	Rollings, Hudig, Hall of Nebraska, Inc.
First National Bank of Omaha	Science Applications International Corp.
FiServ	Shamrock Computer Resources, Ltd.
Ford Motor Credit	St. Joseph Hospital
Genesis	Synergy
Guarantee Mutual Life Insurance	Technical Support, Inc.
HunTel Systems	The Sampson Firm, P.C.
Hyatt Hotels	The Schemmer Associates
Inacom Corporation	Training and Consulting Connection
Kiewit Construction	Transterra Company
Kiewit Engineering Co.	Travel and Transport
Kirkpatrick, Pettis, Smith, Polian, Inc.	U S WEST Communications
KJS Associates	Union Pacific Railroad Company
Lyman Richey Corporation	University of Nebraska Medical Center
McMains	Valmont Industries
Memcom Corporation	Vanguard Research, Inc.
Midwest Computer Products	Vickers
Mutual of Omaha Companies	Word Data Business Systems
Mutual Protective Life Insurance Co.	3 person firm (unidentified)
	38 person firm (unidentified)

Appendix C

Survey Results – All Firms

Company Employment and Education Operations Summary Greater Omaha Only 62 Firms

All Greater Omaha Employees	Now 1995	Forecast in Five Years	Percent Increase
1. Number of All Employees (Greater Omaha)	52,679	58,154	10.39
2. Number of All Employees Now Taking Academic Credit Courses	4,226		
3. Number of All Employees You Feel Should Be Taking Academic Courses	5,509		
4. Number of Those Employees Taking Academic Credit Courses Who Are on a Company Tuition Reimbursement Program:	2,969		
5. Education/Training Budget-Omaha Employers Amount of Training Budget for:	\$30,360,900	\$45,695,000	50.51
a. Internally Provided Training Programs	\$13,529,200	\$17,495,000	29.31
b. External Seminars & Workshops	\$12,657,800	\$20,451,000	61.57
c. Tuition & Cost for College Courses	\$3,617,000	\$7,339,000	102.90
d. Other	\$556,900	\$410,000	-26.38
Greater Omaha Information Technology Employees			
6. Number of Information Technology Employees	6,877	8,705	26.58
7. Number of Information Technology Employees Now Taking Academic Credit Courses	673		
8. Number of Information Technology Employees You Feel Should be Taking Academic Courses	1,434		
9. Number of Those IT Employees Taking Academic Credit Courses Who Are On a Company Tuition Reimbursement Program	523		
10. Education/Training Budget - IT Employees Only	\$ 9,231,100	\$14,743,000	59.71

**Profile of Academic Disciplines for Information Technology Employees
Greater Omaha Operations Only
62 Firms**

Estimated Percent of Employees by Academic Disciplines

Academic Disciplines	Rank Importance of Discipline to Your Firm*	% Employees with these Disciplines	% Employees with these Disciplines in Five Years
Electronic Engineering	3.07	2.2	2.4
Telecommunications	1.93	8.6	9.1
Systems Integration	1.72	9.9	11.6
Computer Engineering & Systems	2.05	13.6	11.4
Systems Development & Business Integration	1.59	37.0	43.1
Technology Management	1.88	8.9	10.2
Technical Marketing	2.72	8.1	8.4
Other		11.6	3.7
	% Sub-baccalaureate	57.9	51.1
	% Baccalaureate	34.7	39.2
	% Graduate	7.4	9.7

Estimated Number of Employees by Academic Disciplines

Academic Disciplines	Rank Importance of Discipline to Your Firm*	# Employees with these Disciplines	# Employees with these Disciplines in 5 Years	Percent Increase
Electronic Engineering	3.07	154	208	35.06
Telecommunications	1.93	592	792	33.78
Systems Integration	1.72	679	1,011	48.90
Computer Engineering & Systems	2.05	938	994	5.97
Systems Development & Business Integration	1.59	2,545	3,755	47.54
Technology Management	1.88	611	889	45.50
Technical Marketing	2.72	557	732	31.42
Other		800	324	-59.50
	% Sub-baccalaureate	3,982	4,445	11.63
	% Baccalaureate	2,388	3,417	43.09
	% Graduate	507	843	66.27

*Rank 1=Most Important 4=Least Important

**Importance of Applied Areas
62 Firms**

Applied Areas	*Rank of Area	**Need Met by Colleges & Universities	**Difference
Electronic Engineering			
• Computer Systems/Architecture	2.42	2.43	0.01
• Directories, Circuits & Systems	3.33	2.71	-0.62
• Comm's, Control & Signal Processing	3.09	2.61	-0.48
• Other			
Telecommunications			
• LAN/WAN Networks, Architecture Design, Mgmt	1.69	2.66	0.97
• Wireless	2.49	2.69	0.20
• Telephony	2.17	2.82	0.65
• Fiber Optics	2.35	3.05	0.70
• Other			
Systems Integration			
• Software/Hardware Configuration	1.54	2.51	0.97
• LAN/WAN	1.72	2.61	0.89
• Technical Purchasing (RFI, RFP, ROI)	2.59	3.08	0.49
• Applied Mfg, Production, Operations	3.07	2.85	-0.22
• Installation/Implementation	2.02	2.70	0.68
• Quality Assurance	1.98	2.74	0.76
• Other			
Computer Engineering & Systems			
• Operating Systems/Compilers/Tools	2.16	2.35	0.19
• Language/CASE	2.42	2.51	0.09
• AI/ES/Inference Engines	2.94	2.89	*0.05
• Architectures/Platforms	2.38	2.63	0.25
• Capacity and Performance Planning	2.24	2.82	0.58
• Numerical Computing/Algorithms	3.22	2.50	-0.72
• Operations Research	3.15	2.85	-0.30
• Standards/Documentation	2.25	2.76	0.51
• Other			
Systems Development & Business Integration			
• Methodology	1.93	2.43	0.50
• Data Warehousing	2.12	2.83	0.71
• Client/Server	1.61	2.43	0.82
• Business Planning/Re-Engineering	2.00	2.66	0.66
• Human Factors Engineering	2.57	2.79	0.22
• Design/Programming	1.86	2.15	0.29
• Decision Support Systems	2.05	2.49	0.44
• Other			

Applied Areas	*Rank of Area	**Need Met by Colleges & Universities	**Difference
Technology Management			
• Project Management	1.47	2.59	1.12
• Business Planning Strategies/Tactics	1.81	2.64	0.83
• Specific Technical Competencies	1.96	2.73	0.77
• Communications Law, Regulation	2.89	2.88	-0.01
• Legal/Ethical/Human Resource Management	2.63	2.66	0.06
• Technology & Social/Economic Change	2.83	2.84	0.01
• Other			
Technical Marketing			
• Business Planning, Strategies, Tools	2.06	2.67	0.61
• Technical Competencies	2.20	2.59	0.39
• Marketing Concepts	2.56	2.77	0.21
• Other	2.32	2.67	0.35

*Rank 1=Most Important 4=Least Important

**Rank 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 All 62 Firms

Technology Areas	*Rank	
	Currently	In 5 Years
Languages	2.04	2.05
Data	1.60	1.54
Telecommunications	1.60	1.44
Client/Server	1.74	1.35
Human Factors Engineering	2.69	2.24
Educational Technologies Learning Services	2.48	2.13
Electronic Commerce	2.52	1.91
CAD/CAM/CAE	3.28	3.05
Object-Oriented Design	2.61	2.04
Artificial Intelligence	3.26	2.63
Multimedia – The Technologies	2.72	2.13
Multimedia – Presentation	2.41	1.95
Virtual Reality	3.60	2.98

*Rank 1=Most Important 4=Least Important

Survey Results – Large Firms

Company Employment and Education Operations Summary Greater Omaha Only 35 Firms with More Than 100 Employees

All Greater Omaha Employees	Now 1995	Forecast in Five Years	Percent Increase
1. Number of All Employees (Greater Omaha)	51,964	56,857	9.42
2. Number of All Employees Now Taking Academic Credit Courses	4,169		
3. Number of All Employees You Feel Should Be Taking Academic Courses	5,348		
4. Number of Those Employees Taking Academic Credit Courses Who Are on a Company Tuition Reimbursement Program:	2,942		
5. Education/Training Budget-Omaha Employers Amount of Training Budget for:	\$30,098,916	\$45,032,000	49.61
a. Internally Provided Training Programs	\$13,453,400	\$17,308,000	28.65
b. External Seminars & Workshops	\$12,510,800	\$20,114,000	60.77
c. Tuition & Cost for College Courses	\$3,578,100	\$7,200,000	101.22
d. Other	\$556,600	\$410,000	-26.34
Greater Omaha Information Technology Employees			
6. Number of Information Technology Employees	6,514	7,968	22.32
7. Number of Information Technology Employees Now Taking Academic Credit Courses	649		
8. Number of Information Technology Employees You Feel Should be Taking Academic Courses	1,350		
9. Number of Those IT Employees Taking Academic Credit Courses Who Are On a Company Tuition Reimbursement Program	508		
10. Education/Training Budget - IT Employees Only	\$ 9,003,100	\$14,269,000	58.49

**Profile of Academic Disciplines for Information Technology Employees
Greater Omaha Operations Only
35 Firms with More Than 100 Employees**

Estimated Percent of Employees by Academic Disciplines

Academic Disciplines	Rank Importance of Discipline to Your Firm*	% Employees with these Disciplines	% Employees with these Disciplines in Five Years
Electronic Engineering	2.97	2.1	2.1
Telecommunications	1.84	8.5	9.1
Systems Integration	1.39	9.3	11.1
Computer Engineering & Systems	1.87	12.6	9.1
Systems Development & Business Integration	1.23	38.3	46.1
Technology Management	1.77	8.7	9.8
Technical Marketing	2.64	8.1	8.5
Other		12.4	4.1
	% Sub-baccalaureate	60.0	54.5
	% Baccalaureate	33.2	36.6
	% Graduate	6.8	8.9

Estimated Number of Employees by Academic Disciplines

Academic Disciplines	Rank Importance of Discipline to Your Firm*	# Employees with these Disciplines	# Employees with these Disciplines in 5 Years	Percent Increase
Electronic Engineering	2.97	136	169	24.26
Telecommunications	1.84	547	714	30.53
Systems Integration	1.39	599	874	45.91
Computer Engineering & Systems	1.87	806	717	-11.04
Systems Development & Business Integration	1.23	2,455	3,627	47.74
Technology Management	1.77	558	773	38.53
Technical Marketing	2.64	519	668	28.71
Other		794	326	-58.94
	% Sub-baccalaureate	3,850	4,289	11.40
	% Baccalaureate	2,127	2,882	35.50
	% Graduate	436	697	59.86

*Rank 1=Most Important 4=Least Important

**Importance of Applied Areas
35 Firms with More Than 100 Employees**

Applied Areas	*Rank of Area	**Need Met by Colleges & Universities	**Difference
Electronic Engineering			
• Computer Systems/Architecture	2.29	2.46	0.17
• Directories, Circuits & Systems	3.31	2.71	-0.60
• Comm's, Control & Signal Processing	3.03	2.62	-0.41
• Other			
Telecommunications			
• LAN/WAN Networks, Architecture Design, Mgmt	1.52	2.68	1.16
• Wireless	2.48	2.67	0.19
• Telephony	1.87	2.79	0.92
• Fiber Optics	2.23	3.08	0.85
• Other			
Systems Integration			
• Software/Hardware Configuration	1.358	2.48	1.10
• LAN/WAN	1.44	2.64	1.20
• Technical Purchasing (RFI, RFP, ROI)	2.48	3.12	0.64
• Applied Mfg, Production, Operations	2.77	2.92	0.15
• Installation/Implementation	1.69	2.76	1.07
• Quality Assurance	1.69	2.75	1.06
• Other			
Computer Engineering & Systems			
• Operating Systems/Compilers/Tools	1.85	2.57	0.72
• Language/CASE	2.00	2.56	0.56
• AI/ES/Inference Engines	2.60	2.96	0.36
• Architectures/Platforms	2.03	2.80	0.77
• Capacity and Performance Planning	1.90	3.04	1.14
• Numerical Computing/Algorithms	3.10	2.76	-0.34
• Operations Research	3.00	3.05	0.05
• Standards/Documentation	2.00	2.83	0.83
• Other			
Systems Development & Business Integration			
• Methodology	1.67	2.56	0.89
• Data Warehousing	1.76	2.92	1.16
• Client/Server	1.33	2.48	1.15
• Business Planning/Re-Engineering	1.87	2.68	0.81
• Human Factors Engineering	2.42	3.00	0.58
• Design/Programming	1.52	2.36	0.84
• Decision Support Systems	1.80	2.67	0.87
• Other			

Applied Areas	*Rank of Area	**Need Met by Colleges & Universities	**Difference
Technology Management			
• Project Management	1.36	2.60	1.24
• Business Planning Strategies/Tactics	1.82	2.60	0.78
• Specific Technical Competencies	1.88	2.92	1.04
• Communications Law, Regulation	2.84	2.96	0.12
• Legal/Ethical/Human Resource Management	2.56	2.67	0.11
• Technology & Social/Economic Change	2.78	2.87	0.09
• Other			
Technical Marketing			
• Business Planning, Strategies, Tools	2.26	2.71	0.45
• Technical Competencies	2.38	2.71	0.33
• Marketing Concepts	2.87	2.88	0.01
• Other			
	2.16	2.75	0.59

*Rank 1=Most Important 4=Least Important

**Rank 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 35 Firms with More Than 100 Employees

Technology Areas	*Rank	
	Currently	In 5 Years
Languages	1.61	1.76
Data	1.30	1.27
Telecommunications	1.52	1.39
Client/Server	1.64	1.21
Human Factors Engineering	2.59	2.16
Educational Technologies Learning Services	2.47	2.06
Electronic Commerce	2.85	2.03
CAD/CAM/CAE	3.28	2.91
Object-Oriented Design	2.45	1.79
Artificial Intelligence	3.25	2.63
Multimedia – The Technologies	2.97	2.28
Multimedia – Presentation	2.67	2.15
Virtual Reality	3.75	3.23

*Rank 1=Most Important 4=Least Important

Survey Results – Small Firms

Company Employment and Education Operations Summary Greater Omaha Only 27 Firms with Less Than 100 Employees

All Greater Omaha Employees	Now 1995	Forecast in Five Years	Percent Increase
1. Number of All Employees (Greater Omaha)	715	1297	81.40
2. Number of All Employees Now Taking Academic Credit Courses	57		
3. Number of All Employees You Feel Should Be Taking Academic Courses	161		
4. Number of Those Employees Taking Academic Credit Courses Who Are on a Company Tuition Reimbursement Program:	27		
5. Education/Training Budget-Omaha Employers Amount of Training Budget for:	\$ 262,000	\$ 663,000	153.05
a. Internally Provided Training Programs	\$ 73,000	\$ 190,000	160.27
b. External Seminars & Workshops	\$ 150,000	\$ 335,000	123.33
c. Tuition & Cost for College Courses	\$ 39,000	\$ 138,000	253.85
d. Other			
Greater Omaha Information Technology Employees			
6. Number of Information Technology Employees	363	737	103.03
7. Number of Information Technology Employees Now Taking Academic Credit Courses	24		
8. Number of Information Technology Employees You Feel Should be Taking Academic Courses	84		
9. Number of Those IT Employees Taking Academic Credit Courses Who Are On a Company Tuition Reimbursement Program	15		
10. Education/Training Budget - IT Employees Only	\$ 228,000	\$ 474,000	107.89

**Profile of Academic Disciplines for Information Technology Employees
Greater Omaha Operations Only
27 Firms with Less Than 100 Employees**

Estimated Percent of Employees by Academic Disciplines

Academic Disciplines	Rank Importance of Discipline to Your Firm*	% Employees with these Disciplines	% Employees with these Disciplines in Five Years
Electronic Engineering	3.20	4.1	4.6
Telecommunications	2.08	9.9	9.3
Systems Integration	2.12	18.5	16.0
Computer Engineering & Systems	2.27	30.5	31.7
Systems Development & Business Integration	2.08	17.1	17.1
Technology Management	2.04	11.6	13.7
Technical Marketing	2.80	8.2	7.7
Other			
	% Sub-baccalaureate	20.5	20.1
	% Baccalaureate	62.2	62.8
	% Graduate	17.4	17.1

Estimated Number of Employees by Academic Disciplines

Academic Disciplines	Rank Importance of Discipline to Your Firm*	# Employees with these Disciplines	# Employees with these Disciplines in 5 Years	Percent Increase
Electronic Engineering	3.20	15	34	126.67
Telecommunications	2.08	36	68	88.89
Systems Integration	2.12	67	118	76.12
Computer Engineering & Systems	2.27	111	234	110.81
Systems Development & Business Integration	2.08	62	126	103.23
Technology Management	2.04	42	101	140.48
Technical Marketing	2.80	30	57	90.00
Other				
	% Sub-baccalaureate	74	148	100.00
	% Baccalaureate	226	463	104.87
	% Graduate	63	126	100.00

*Rank 1=Most Important 4=Least Important

**Importance of Applied Areas
27 Firms with Less Than 100 Employees**

Applied Areas	*Rank of Area	**Need Met by Colleges & Universities	**Difference
Electronic Engineering			
• Computer Systems/Architecture	2.58	2.38	-0.20
• Directories, Circuits & Systems	3.36	2.70	-0.66
• Comm's, Control & Signal Processing	3.16	2.60	-0.56
• Other			
Telecommunications			
• LAN/WAN Networks, Architecture Design, Mgmt	1.92	2.63	0.71
• Wireless	2.50	2.73	0.23
• Telephony	2.57	2.87	0.30
• Fiber Optics	2.50	3.00	0.50
• Other			
Systems Integration			
• Software/Hardware Configuration	1.76	2.56	0.80
• LAN/WAN	2.08	2.55	0.47
• Technical Purchasing (RFI, RFP, ROI)	2.74	3.00	0.26
• Applied Mfg, Production, Operations	3.48	2.70	-0.78
• Installation/Implementation	2.46	2.60	0.14
• Quality Assurance	2.36	2.73	0.37
• Other			
Computer Engineering & Systems			
• Operating Systems/Compilers/Tools	2.56	1.90	-0.66
• Language/CASE	2.96	2.44	-0.52
• AI/ES/Inference Engines	3.41	2.77	-0.64
• Architectures/Platforms	2.83	2.33	-0.50
• Capacity and Performance Planning	2.67	2.43	-0.24
• Numerical Computing/Algorithms	3.36	2.00	-1.36
• Operations Research	3.35	2.50	-0.85
• Standards/Documentation	2.58	2.62	0.04
• Other			
Systems Development & Business Integration			
• Methodology	2.29	2.24	-0.05
• Data Warehousing	2.60	2.71	0.11
• Client/Server	2.00	2.35	0.35
• Business Planning/Re-Engineering	2.17	2.63	0.46
• Human Factors Engineering	2.77	2.43	-0.34
• Design/Programming	2.35	1.81	-0.54
• Decision Support Systems	2.36	2.24	-0.12
• Other			

Applied Areas	*Rank of Area	**Need Met by Colleges & Universities	**Difference
Technology Management			
• Project Management	1.62	2.58	0.96
• Business Planning Strategies/Tactics	1.79	2.71	0.92
• Specific Technical Competencies	2.09	2.44	0.35
• Communications Law, Regulation	2.96	2.73	-0.23
• Legal/Ethical/Human Resource Management	2.73	2.64	-0.09
• Technology & Social/Economic Change	2.91	2.79	-0.12
• Other			
Technical Marketing			
• Business Planning, Strategies, Tools	1.78	2.63	0.85
• Technical Competencies	1.95	2.40	0.45
• Marketing Concepts	2.14	2.60	0.46
• Other			
	2.53	2.54	0.01

*Rank 1=Most Important 4=Least Important

**Rank 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 27 Firms with Less Than 100 Employees

Technology Areas	*Rank	
	Currently	In 5 Years
Languages	2.63	2.50
Data	2.00	1.92
Telecommunications	1.72	1.50
Client/Server	1.88	1.54
Human Factors Engineering	2.83	2.36
Educational Technologies Learning Services	2.50	2.22
Electronic Commerce	2.04	1.73
CAD/CAM/CAE	3.28	3.25
Object-Oriented Design	2.83	2.41
Artificial Intelligence	3.28	2.63
Multimedia – The Technologies	2.40	1.92
Multimedia – Presentation	2.08	1.67
Virtual Reality	3.40	2.67

*Rank 1=Most Important 4=Least Important