City of Cambridge

ECONOMIC DEVELOPMENT, TRAINING AND EMPLOYMENT COMMITTEE MEMBERS
Councillor Henrietta Davis, Chair
Councillor Marjorie C. Decker
Vice Mayor David P. Maher

In City Council December 17, 2001

The Economic Development, Training and Employment Committee conducted a public meeting on Tuesday, November 27, 2001 at 9:10 a.m. in the Ackermann Room.

The purpose of the meeting was to discuss a working plan for the distribution of a final report entitled "Education and Skill for the New Economy: A Survey of Employment Trends in Cambridge, Massachusetts." (A copy of the report is attached.)

Present at the meeting were Councillor Henrietta Davis, Chair of the Committee, Vice Mayor David Maher, Beth Rubenstein, Assistant City Manager for the Community Development Department (CDD), Elaine Madden, Senior Project Planner, Economic Development Division of the Community Development Department, Ellen Semonoff, Deputy Director, Human Services Department, Sue Walsh, Director, Office of Workforce Development, Seth Boyd, Business Liaison, Office of Workforce Development, Jason Marshall, Assistant to the Mayor, Alice Turkel, School Committee Member, Steve Spofford, Executive Director, Rindge School of Technical Arts (RSTA), Kerry Dunnell, Social Work Intern, Lisa Stuardi, Director, Government and Community Affairs, Chamber of Commerce, Steven Swanger, Director of Tenant Services, Cambridge Housing Authority, Kevin Sheehan, business owner, John Immel, business owner and Donna P. Lopez, Deputy City Clerk.

Councillor Davis opened the meeting. Introductions of attendees were made. She gave an overview of the work of the committee thus far. Councillor Davis stated that Elaine Madden from the Economic Division of the Community Development Department would give a brief presentation on the report entitled "Education and Skill for the New Economy: A Survey of Employment Trends in Cambridge, Massachusetts." Elaine Madden gave an overview of the report that has been worked on since 2000. Surveys were mailed to 999 firms. (See Appendix B) A total of 131 responses were received representing a response rate of 13.1%. In June 2001 the report was distributed. The goal was to provide effective links and to include employment opportunities to Cambridge residents.

The industry sectors were identified into four clusters as follows:

- Information Technology;
- Science;
- Health; and
- Business and Finance.

The sizes of the firms were categorized as more than 50 employees would be considered a large firm and less than 50 employees would be considered a small firm.

In 1988, she stated that 40% of the total Cambridge employment was found in firms in the new four economy industry clusters.

The 20 most frequently reported job types in the new economy are outlined in page 9. The top three job types comprise 29% of the total employment in the new economy. The growth rate of these job types in the next five years is on page 14. Engineers, she said, represents the largest share of total employment in the new economy. The growth rate is significant and will continue to have an increase in employment in the next five years. Councillor Davis stated that she never thought of these job types as top jobs.

Vice Mayor Maher asked for an example of engineering jobs. Ms. Madden stated an engineer type job could also be a computer engineer. Ms. Semonoff stated that there are two different degree requirements for an engineer- a doctorate and bachelors. This is an issue of what it means to Cambridge as it relates to education in our schools. Education requirement chart is found in page 10. Elaine Madden stated that the five-year job growth rate with growth rates of 50% or more appears on page 13. She stated that the job type of architect/planner is the only job from the top ten jobs that appears in the growth rate chart.

Ellen Semonoff stated that it is interesting that the job types are not associated with the new economy growth rates.

Alice Turkel asked if housekeeping was only in the medical field. Ms. Madden responded in the affirmative.

A discussion ensued relative to educational requirements. Ms. Madden stated that there is a 63.7% requirement for a bachelors, masters or doctorate degree for jobs in the new economy. Ms. Turkel stated that students could be reported to state that they are going to college but never complete their college education. Vice Mayor Maher stated that a student could have a failing grade and state that they are going to college.

Elaine Madden stated that the job types were condensed. The characteristics of the top 10 jobs reveals:

- Training opportunity are close to 50%; and
- 9 out of 10 firms had more than75% of employees reporting opportunity for advancement.

Elaine Madden outlined the skill requirement for the new economy. The top four required skills are:

- Critical thinking;

- Industry specific knowledge;
- Customer service; and
- Verbal skills.

She further stated that there is also a need for "soft skills." She next discussed the summary table of top education and skill requirements by the industry clusters found on page 15.

Ellen Semonoff stated that there is an assumption of skills when a person has gone to college.

Elaine Madden stated that the policy impact to the workforce is:

- The importance of a college degree;
- The need for skill training;
- The need for training for advancement outside the workspace;
- The need for employers to offer training; and
- The need for higher education especially in Information Technology and Science.

The medical and scientific areas are the fields that show the most growth in Cambridge. Internships, she said, could help Cambridge residents. She hoped that the survey would be utilized in the education forum.

At the conclusion of Ms. Madden's presentation, Councillor Davis stated that her purpose in holding this meeting is to make sure that the report is distributed and to look for ways to make use of this information.

Ms. Semonoff stated that the vast majority of businesses do not hire Cambridge residents. Cambridge residents are not likely to be referred by fellow employees when there is a small number of Cambridge residents employed, she said.

Councillor Davis suggested the creation of a task force to get the information out to the parties who will make the most use of the information. There should be a partnership between the schools, businesses, and the city, she said. Councillor Davis stated that as a community the city is faced with high housing costs and this committee can assist in keeping the community stable by making the residents part of the new economy. There is a need for further communication with the business community.

Alice Turkel stated that there are two other groups other than the business community to be impacted. They are the young people in the school system and persons out of the school system who are not employed.

The partnership could consist of the city doing the outreach and the businesses providing the training. She suggested a written article for placement in the newspaper.

Kevin Sheehan stated that the data contained in the report should be provided to the students in the high school. Ms. Turkel responded that this could be done as part of the senior-advising group. Ms. Semonoff stated that the students to use their analytical skills could process this report. She expressed her concern over the 50% cut in adult education programs due to the cuts in the state budget.

Councillor Davis stated that school children do not have a realistic sense of what opportunities there are in the world. Ms. Stuardi asked if the high school has a career day. Ms. Turkel responded that junior high school children have a career day. Ms. Walsh stated that there is no institutional way for all students to be aware of career opportunities. Ms. Stuardi suggested that representatives from top businesses go visit the high school.

Vice Mayor Maher stated that the report is a snapshot and that plans should not be made based on the report because of possible changes in the economy. He cited that Cambridge residents who are employees of Polaroid are in a difficult position because they are losing their jobs. These employees are not of retirement age and are losing their health insurance. The jobs for some employees are the only jobs they have ever held. The retooling of the workforce should be reviewed.

Alice Turkel asked if there are resources for adults who may need guidance when they are losing their job. Vice Mayor Maher responded Career Source. Councillor Davis stated that there is a limitation of resources. Career Source has a regional focus. Ms. Turkel stated that the task force could look at the connection.

Vice Mayor Maher spoke about the civil service process. The system is hard to manipulate.

Ms. Rubenstein stated that this is the first time that the survey has been done and the results are just a snapshot. This survey went out in a different universe. The Task Force, she said, needs to establish goals.

Steve Spofford stated that he has been requested to focus on career education. The new economy is what RSTA is focusing on. Every student should have a working toolbox of skills, he said. Some changes do temper the document. He further stated that he would like to work with the task force. Entry level positions need to be identified. RSTA can foster student interests in fields such as engineering.

Steven Swanger stated that the report should be cognizant of the collaboration with the community college system and a connection should be made with the RSTA program. Mr. Spofford stated that in the future, RSTA would be opened at night for adult education and to provide enrichment. He is planning the addition of a pre-engineering program, graphic arts/design, health care, biotech and mass media to the RSTA programs. It is the responsibility of educators to foster interest, he said. A link is needed between the technical and the practical learning skill aspect of RSTA.

Councillor Davis asked how does the committee reach out to the business community.

Seth Boyd stated that when employers are not looking for employees it is hard to focus on needs. There needs to be a proactive link to job seekers and resources to acquire jobs. John Immel, business owner, stated that the business community will get involved when they see a benefit to the business community. The Task Force needs to address fundamental needs of business. He suggested videos of interviews of persons in various jobs for job seekers who are looking for job satisfaction.

Kevin Sheehan stated that the question is whether employers are willing to pay employees for jobs that are now just shifting and what is industry willing to pay skilled labor.

Lisa Stuardi asked what is the focus: Cambridge companies or Cambridge residents. It is easier to request specific functions from the business community rather than to provide information. People with college education are assumed to have a set of skills by businesses. Career development is needed for job seekers that do not know how to market themselves.

Ms. Semonoff stated that the focus is to make this process work for all, especially those individuals who are having difficulty finding their way through the system.

In conclusion, Vice Mayor Maher stated that by hiring Cambridge residents there is less pollution in the city, the vitality of the city is improved and bonuses are provided to businesses.

Councillor Davis stated that she and Vice Mayor Maher will compose an order to refer this to the City Manager to appoint a Task Force that will review the goals of the report to create a partnership between businesses, schools, RSTA, Chamber of Commerce and workforce and economic development professionals. She thanked all attendees.

The meeting adjourned at 10:50 a.m.

For the Committee,

Henrietta Davis

Councillor Henrietta Davis, Chair

Note: On December 3, 2001 Order #5 was adopted on this matter.

Education and Skills for the New Economy:

A Survey of Employment Trends in Cambridge, Massachusetts

City of Cambridge

Community Development Department

Economic Development Division

June 2001

Jennifer James
Economic Development Intern
Spring 2000 - 2001

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Education and Skills for the New Economy:

A Survey of Employment Trends in Cambridge, Massachusetts
June 2001

Summary and Key Findings

The Economic Development Division (EDD) of the Community Development Department has designed and carried out a survey of new economy employers to learn more about labor trends in the Cambridge economy. The goal of the survey and subsequent analysis is to gain a better understanding of the current and future labor needs of the city to provide better links between workforce policies, school curricula and the jobs of tomorrow.

The "new economy" has been defined as the flexible production of goods and services. (Atkinson, 1998). In contrast, economists and policy researchers generally agree that the "old economy" is centered on the mass production of goods. New economy sectors are said to be largely responsible for the economic boom in the 1990's and a significant proportion of new job creation during this period.

New economy jobs are important to the Cambridge economy. In 1998, 40% of total employment in Cambridge was found in firms in the four new economy industry clusters surveyed for this report: Information Technology, Science, Health, and Business & Finance. Across these four clusters, the highest employment level is projected to be in the positions of *Engineer, Nurse, Administration (including Administrative Assistant), Architect/Planner, Scientist, Software Engineer, Medical Technician, Computer Technician,* and *Physical Therapist.* In addition, the survey found that the job types in new economy with the highest growth rates tend to be in the medical field.

Many of the job types discussed in this report, both existing and projected, require technical or educational training beyond the high school level and some beyond a four-year college degree. Higher education is an integral part of employment in the new economy. Sixty-four percent of employees in job types reported require an education level of bachelor's degree or higher.

The new economy places an emphasis on the ability to think critically, obtain skills specific to an industry or job, and excel in customer service. Employers also voiced a need for verbal communication and data analysis skills. While most people assume that new economy jobs require considerable "hard skills", the survey results also focuses attention on the equally important need for having "soft skills" (verbal communication, customer service). The fact that the top reported skill requirement for the new economy is *Critical Thinking* is interesting given the private sector's tendency to train employees in job specific skills and not in a general skill like *Critical Thinking.*

The survey results suggest that employers are willing to train employees in certain job types but workers need to bring certain skills to a job, especially for higher skilled positions. This is seen in the list of characteristics for the top ten job types (Table 3.1 page 6). Typically, employers report offering more training to higher level positions; however, in our survey results, employers reported more access to training for those in lower skilled positions.

KEY FINDINGS

- New economy jobs are important to the Cambridge economy. In 1998, *40% of total employment in Cambridge* was found in firms in the four new economy industry clusters surveyed, Information Technology, Science, Health and Business & Finance (Chart 3.1, page 7).
- The *top 3 most frequently reported job types* and their percent of total employment across the four industry clusters are: Engineer (12.8 percent), Nurse (10.9 percent), Administrative Assistant (5.8 percent), totaling 29.5 percent of total employment (Chart 3.2, page 9).
- *Engineers represent the largest share of total employment* in new economy firms, and are projected to have a strong growth rate; these factors combined suggest that this job type will continue to have a large employment presence in new economy firms in Cambridge over the next five years (Chart 3.5, page 14).
- *Higher education* is an integral part of employment in the new economy. 63.7 percent of employees in the job types reported require an education level of bachelor's degree or higher (Chart 3.3, page 10).
- The *top 3 skill requirements* identified in the survey across all four industry clusters are: Critical Thinking, Industry Specific Knowledge (experience in the field), Customer Service, followed closely by Verbal Communication and Data Analysis. While most people assume that new economy sectors require considerable "hard skills," the survey results bring attention to the equally important need for having "soft skills" (Chart 3.4, page 11).
- *Training opportunities* support the ability of workers to update their qualifications and remain flexible participants in the workforce. Of the top ten job types reported in the survey, those in which close to 50 percent or more employees have access to employer-sponsored training are: Data Analyst, Administrative Assistant, Nurse Assistant and Scientist (Table 3.1, page 6).
- *Opportunity for advancement*, the ability to obtain a job and progress into higher-level positions, is important to employees. In 9 of the top 10 most frequently reported job types, more than 75 percent of employees in each job type are reported to have access to advancement opportunities (Table 3.1, page 6).
- The *top ten job types in 5 years* are projected to be: Engineer, Nurse, Administrative Assistant, Administration, Architect/Planner, Scientist, Software Engineer, Medical Technician, Computer Technician, Physical Therapist (Chart 3.5, page 14).
- The *3 most frequently reported recruitment methods* by percent of total are: recommendations from employees, newspaper and Internet (Table 3.3, page 12).

SECTION 1: INTRODUCTION

Public dialogue around the emergence of a "new economy" in the US is heard in many quarters, from the White House to the households of American citizens. New economy sectors are said to be largely responsible for the economic boom in the 1990's and a significant proportion of new job creation during this period. Economists and policy researchers generally agree that the "old economy" centered on the mass production of goods. The "new economy" hinges upon the flexible production of goods and services (Atkinson, 1998). The information technology (IT) sector has been largely responsible for the shift in production methods in the private market. The tools and products created by the information technology sector transformed business processes thereby impacting other facets of the U.S. economy. In addition, increased global competition in the market place has spurred private firms to adopt new production methods to improve their competitive edge (Levy, 1999).

Within the new economy, several key sectors have captured substantial attention for their number of emerging businesses, rising stock prices and creation of new types of employment. In the wake of disappearing manufacturing jobs, the Massachusetts economy is gaining a competitive advantage in business sectors that are being labeled as new economy industries. According to a study published by the Massachusetts Department of Employment and Training, through 2006 the state will experience the fastest growth in *computer software, research and testing, engineering, higher education, medicine* and *management consulting* industries.[1] At the top of the list, *computer software and related services*, or IT-related sectors, exhibit the highest projected growth rate (88.9%) compared to all other industry classifications, and are expected to create an estimated total of 55,800 new jobs by 2006.

The new economy is generally made up of the fastest growing sectors of the economy. These sectors rely on new production processes and the use of information in daily operations. In an effort to more clearly define the industry composition of the new economy, specific sectors were organized into four industry clusters[2] for this report and the survey it is based on: IT related, science & research related, health related and business & finance related groups.

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[1] *The Massachusetts Job Outlook through 2006* (1997). This publication looks at job change between 1996 and 2006.

[2] The sectors chosen as "new economy sectors" correspond with the projected high growth industries for Massachusetts reported by the MA Department of Labor published in *The Massachusetts Job Outlook through 2006.*

The fastest growing industry sectors in Massachusetts are also some of the largest employment sectors in Cambridge. In 1998, the four industry clusters noted above represented 45,596 employees or approximately 40 percent of total employment in Cambridge. More specifically, Cambridge employment for each cluster breaks down as follows: information technology related (14,631 employees or 12.8 percent of the **total** employment in Cambridge), science related (9,658 employees or 8.4 percent)), health related (7,701 employees or 6.6 percent), and business & finance related (13,606 employees or 11.9 percent). Appendix A contains a table listing the number of employees in each sector included in the four industry clusters. In the year 2000, businesses in these four industry clusters represented approximately 20 percent of total private businesses in Cambridge, or 999 of 5,051 businesses. Other Cambridge industry sectors with large employment numbers in 1998 included educational services (24,137 employees or 21.2 percent of total Cambridge employment), eating & drinking establishments (6,268 employees or 5.5 percent), and government employees (7,907 employees or 6.9 percent). However, they are not labeled as "new economy" since they are less dependent upon new production processes. The four industry clusters are important due to their high growth rates and employment base and are therefore a key component of the labor market for the city.

Strong employment in new economy sectors is changing the type of jobs available to Cambridge residents. Yet the growth of employment in these occupations may not be good news for everyone, especially for those with limited skills and education, if workers are unable to access employment opportunities. It is therefore important to understand the skill and education characteristics required by employers in new economy sectors in order to prepare today's students and workers for future employment. In response to this need, the Economic Development Division (EDD) of the Community Development Department has designed and carried out a survey of new economy employers to learn more about labor trends in the Cambridge economy. The goal of the survey and subsequent analysis is to gain a better understanding of the current and future labor needs of the city to provide better links between workforce policies, school curricula and the jobs of tomorrow.

SECTION 2: METHODOLOGY

The Economic Development Division (EDD) of the Community Development Department developed a research strategy to identify and survey firms in the four new economy industry clusters previously described.

Survey questions focused on current job types, number of employees, skill and educational requirements for each job type, projected growth for each job type and employee recruitment methods of the firm. The survey is included in Appendix B. Firms were identified by Standard Industry Classification (SIC) Codes, which indicate their primary line of business, and selected from the EDD database of Cambridge businesses[3]. The selected SIC codes were categorized into four industry clusters: *information technology* (IT), *science-related* (including drug research & testing, and equipment development), *health-related*, and *business and finance service* industries. A list of the SIC codes for each industry cluster is included in Appendix A.

The survey was mailed in November of 2000 to a total of 999 firms belonging to these four industry clusters. A copy of the survey was sent to each firm's president or CEO and human resource director with a cover letter from Cambridge City Manager, Robert W. Healy. Staff in the Economic Development Department and the Cambridge Chamber of Commerce made follow-up calls in January and February of 2001 to non-responding larger firms (over 20 employees), in an effort to improve the response rate. The City is treating with confidentiality the name and details of the surveys of the responding firms, a request made by some firms as a condition to their responding to the survey.

A total of 131 surveys were completed and returned for a response rate of 13.1 percent, which is typical of a direct mail survey. Table 2.1 displays the number of surveys sent and returned, by industry cluster.

TABLE 2.1: RESPONSE RATE FOR SURVEY OF CAMBRIDGE FIRMS

INDUSTRY CLUSTERS	SENT	RETURNED	% RETURNED
IT	235	29	12.4%
Science	128	23	18.0%
Health (>10 employees)	60	10	16.7%
Business & Finance	576	69	12.0%
Total	**999**	**131**	**13.1%**

[3]1998 American Business Information, Inc., Omaha, NE database of Cambridge businesses.

In addition to the survey response rate, it is also important to look at the proportion of firms by industry cluster that returned the survey. The two pie charts (2.1 and 2.2) below show that the sample of surveys returned closely reflects the proportion of new economy firms that exist in Cambridge.

CHART 2.1
CAMBRIDGE FIRMS BY TYPE

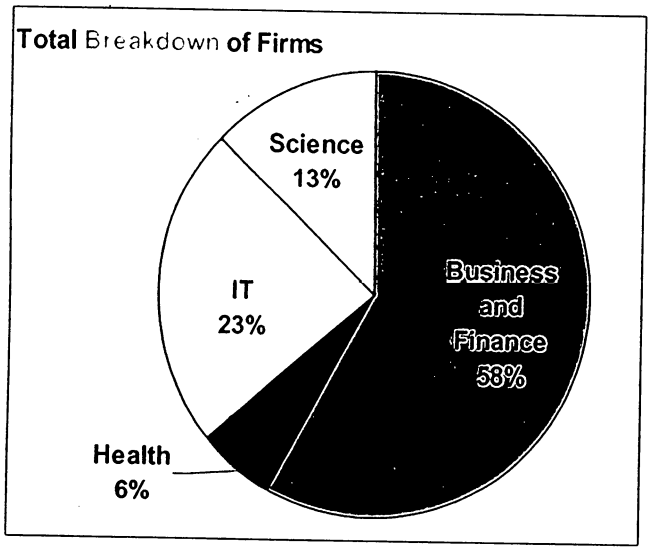
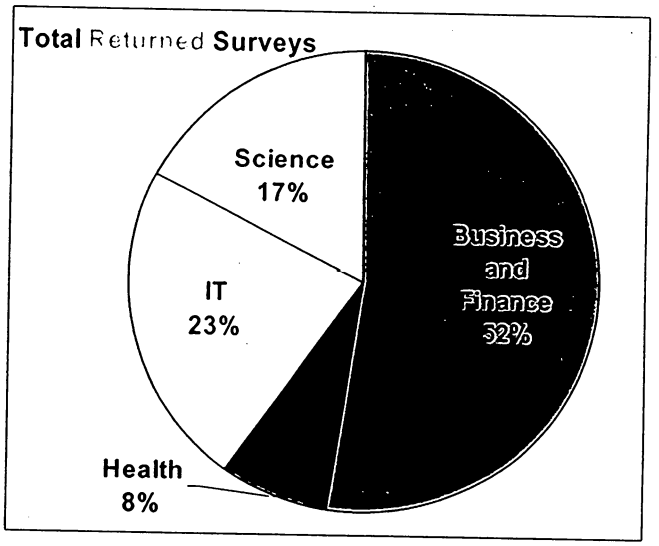


CHART 2.2
FIRMS IN SAMPLE BY TYPE



The size of firms that returned surveys is also an important characteristic of the survey sample, since job types may be systematically different in small and large firms[4]. In the sample of surveys returned, large firms represent 17.6 percent, which is slightly greater than the 12.2 percent of large firms found in Cambridge. Thus, larger firms are slightly over-represented compared to small firms.

The survey data were analyzed to look at employment trends in Cambridge from two perspectives: across all respondents and respondents by industry cluster.

[4] Small firms were defined by less than 50 employees while larger firms have more than this number.

SECTION 3: FINDINGS AND RESULTS

Information collected through the survey was analyzed in two ways. First, we looked at the combined data reported by all the firms to get an overview of employment in Cambridge related to the new economy. Second, the surveys were grouped by industry cluster and analyzed in order to develop a more specific picture of employment patterns for each cluster.

I. General Information on the New Economy in Cambridge

This section briefly discusses key trends in job types and employment requirements across all four industry clusters. The data collected from the surveys describes 4944 individuals employed in 312 different job types at 131 firms across all four industry clusters. Analyzing over 312 different job types made it difficult to see patterns in the data because some of the categories only reported 2 or 3 employees each. Therefore, the 312 job types were re-categorized into 84 *aggregate job types* (see Appendix C for list) to facilitate the review of reported information and to identify patterns within the data.

Job types with similar titles or functions were grouped together. In general, this involved collapsing hierarchies within a job type into one category; for example, junior and senior engineer became engineer. The aggregate job type categories are generally straightforward (see Appendix C for a list of the 84 aggregate job types), but a few are broad enough to require a description of the types of positions included in the category.

- *Executive Management* includes senior level management positions like President, Vice President and Chief Officers.
- *Administration* includes non-director positions in administration that are higher than an administrative assistant position - office manager, personnel staff etc.
- *Computer Technician* includes hardware & software technical support and database design & management positions.
- *Accountant* includes positions with financial or accounting duties at various seniority levels.
- *Analysts* were separated into *Data Analysts* and *Financial Analysts.*
- The *Graphic* category includes art-related and graphic design positions that required technical software and artistic skill.
- *Medical Technicians* include positions that required some knowledge about equipment or medicine plus experience in the field, but not a medical degree.
- *Production* jobs include production assistants for a range of products from consulting reports to software applications.

Aggregating the job types greatly improved the visibility of employment patterns in the data.

A. OVERVIEW OF TOP TEN (10) JOB TYPES IN NEW ECONOMY SECTORS

Table 3.1 summarizes the characteristics for the *top ten* job types most frequently reported in the survey results. The table displays the salary range and the educational requirements most frequently reported for each job type, as well as the percentage of employees who receive advancement and training opportunities. The job types are ranked in the order by which they were most frequently reported.

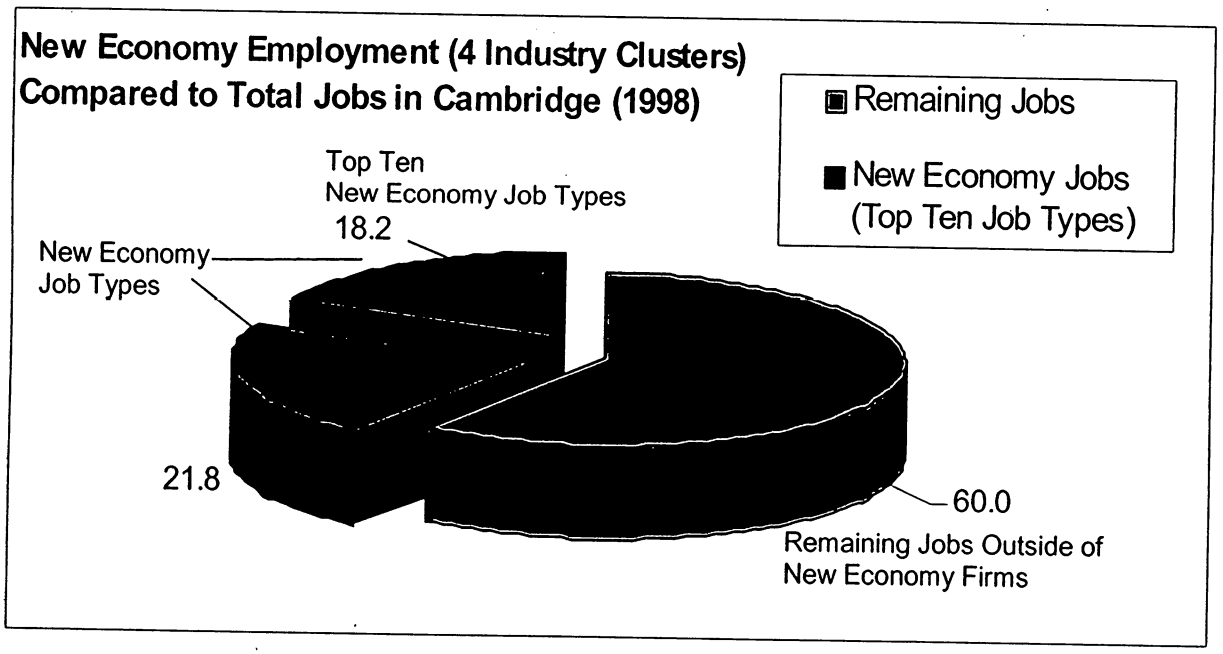
TABLE 3.1
CHARACTERISTICS OF TOP TEN JOB TYPES IN NEW ECONOMY
(IT, SCIENCE, HEALTH AND BUSINESS & FINANCE CLUSTERS)

RANK	TOP TEN JOB TYPES (FREQUENTLY REPORTED)	SALARY RANGE (000's)	EDUCATION LEVEL	PERCENT EMPLOYEES REPORTING ADVANCEMENT	PERCENT EMPLOYEES REPORTING TRAINING
1	ENGINEER	80-100	BACHELOR	98.7	1.6
2	NURSE	40-60	BACHELOR PLUS LICENSE	97.4	20.8
3	ADMINISTRATIVE ASSISTANT	20-40	HIGH SCHOOL	56.1	62.2
4	MANAGEMENT	60-80	BACHELOR	82.4	29.7
5	NURSE ASSISTANT	20-40	HIGH SCHOOL WITH TECH CERT	100.0	59.9
6	ARCHITECT/PLANNER	60-80	MASTERS	78.7	14.3
7	RESEARCHER	40-60	BACHELOR	82.4	14.1
8	SCIENTIST	40-60	MASTERS	76.4	49.7
9	COMPUTER TECHNICIAN	40-60	BACHELOR	85.0	20.5
10	DATA ANALYST	40-60	BACHELOR	100.0	96.6

As noted in Section 1, in 1998, the four new economy industry clusters surveyed represented 45,596 employees or approximately *40 percent of total employment* in Cambridge (Chart 3.1 below). The number of jobs in the top ten job types comprise 54.4 percent of the total jobs reported in the survey, a sizable percentage of the 84 total job types. This is significant in that the characteristics and requirements of these job types represent over 50 percent of the jobs in the new economy. When considering the overall job market in Cambridge, these ten job types therefore represent nearly 20 percent (18.2) of the overall jobs in Cambridge as depicted by Chart 3.1 below.

A review of the top ten job types shows that the three most frequently reported job types are Engineer, Nurse and Administrative Assistant. Of significant note is that two of these three job types require considerable years in higher education and specialization in skill.

Chart 3.1



Training and Advancement

A picture of employment is not complete without an understanding of training and advancement opportunities related to the jobs generated by new economy firms. The ability to obtain a job and then progress into higher level positions is important to employees. Training opportunities support the ability of workers to update their qualifications and remain flexible participants in the labor force. Therefore, the survey asked employers to identify whether each job type has access to employer-sponsored training and also allows for advancement within the firm. Seven of the top ten job types report that less than 50 percent of employees have access to employer-sponsored training. The three job types where more than 50 percent of employees can access training are *Administrative Assistant*, *Nursing Assistant*, and *Data Analyst*. Lower training levels may influence the rate at which employees are promoted, since training is often a requirement for advancement. However, this survey did not specifically research the requirements for advancement.

While training prepares workers for existing and new challenges in the workplace, the ability to advance into better employment opportunities is dependent upon a firm's willingness to promote workers. For nine of the top ten job types across all four

industry groups, more than 75 percent of employees in each job type reported access to advancement opportunities. The tenth, *Administrative Assistant*, reported over 50 percent access to advancement.

More employees in each of the top ten job types report access to advancement opportunities than to employer-sponsored training.

Employment of Cambridge Residents

Another key issue for employment trends in the city is the degree to which Cambridge residents are employed by Cambridge firms. To gain a better understanding of this issue, the survey asked employers to estimate the percent of their existing workforce that is made up of Cambridge residents. The results are displayed in Table 3.2 below. The results show that most of the firms report low percentages of Cambridge residents as employees. This is especially true for larger firms (not shown in table). All of the firms with over 100 employees reported less than 40 percent of their employees as Cambridge residents, and most of these firms fall in the 0 to 10 percent range. As firm size decreases, the percent of Cambridge residents employed increases.

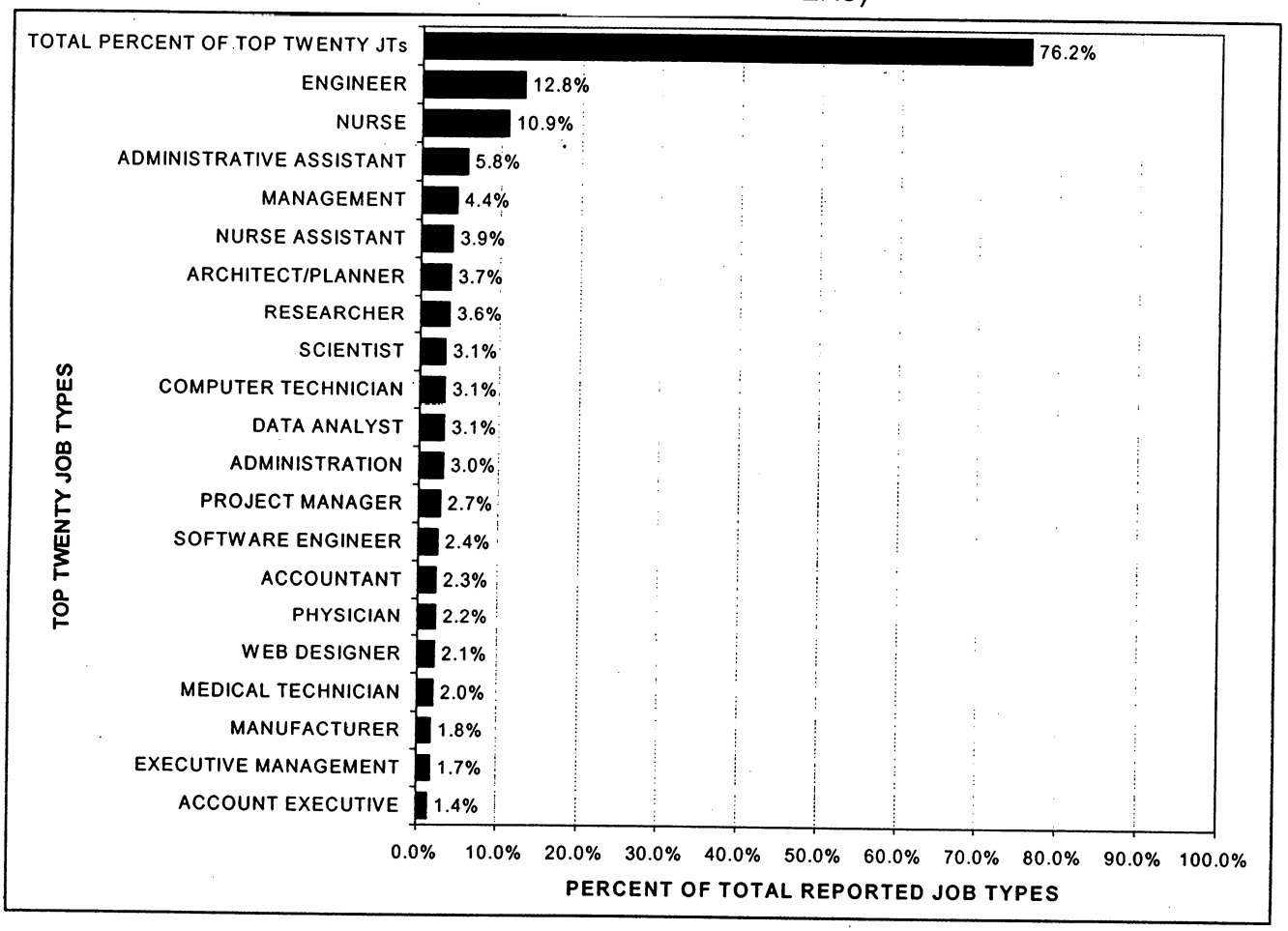
Table 3.2: DISTRIBUTION OF FIRMS BY PERCENT OF CAMBRIDGE RESIDENTS

PERCENT OF COMPANY EMPLOYEES THAT ARE CAMBRIDGE RESIDENTS	NUMBER OF COMPANIES IN RANGE	PERCENT OF COMPANIES IN RANGE
0% - 10%	59	48.4%
11% - 20%	16	13.1%
21% - 30%	16	13.1%
31% - 40%	7	5.7%
41% - 50%	4	3.3%
51% - 60%	3	2.5%
61% - 70%	4	3.3%
71% - 80%	2	1.6%
81% - 90%	1	0.8%
91% - 100%	10	8.2%
TOTAL FIRMS REPORTING	122	

B. TOP TWENTY REPORTED JOB TYPES IN NEW ECONOMY SECTORS

A wider picture of employment in the new economy is seen in the list of the top twenty most frequently reported job types. This information is reported by the bar graph in Chart 3.2, page 9. The graph clearly displays each job type ranked by its percent of total employment. The top twenty job types represent 76.2 percent of the total employment across the IT, Science, Health and Business & Finance clusters.

Chart 3.2
TWENTY MOST FREQUENTLY REPORTED JOB TYPES (JTs) IN NEW ECONOMY
(IT, SCIENCE, HEALTH AND BUSINESS & FINANCE CLUSTERS)



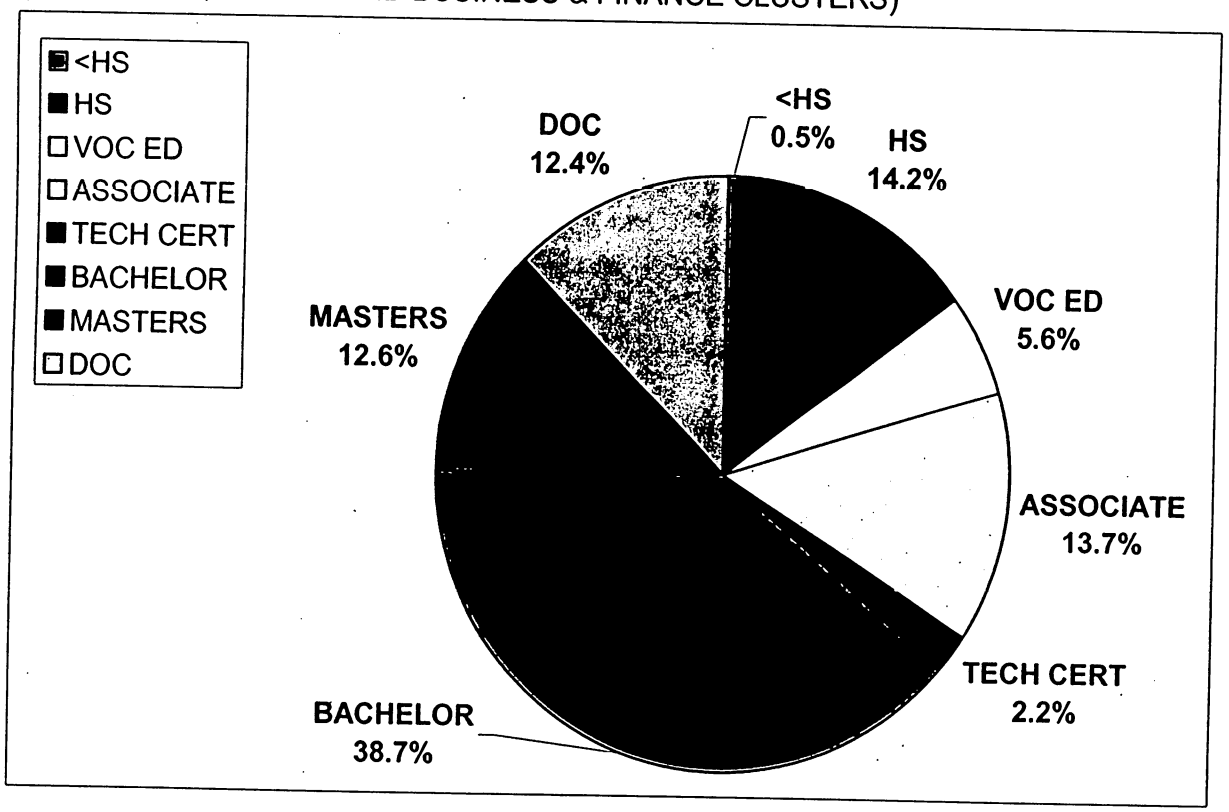
C. EDUCATIONAL & SKILL REQUIREMENTS ACROSS ALL JOB TYPES

The education and skill characteristics described by the survey results were analyzed across all job types and firms. Education characteristics of new economy job types are summarized in the following Chart 3.3. For the purposes of the survey, *educational requirements* were categorized as less than high school (<HS), high school (HS), vocational education (VOC ED), associate's degree (ASSOCIATE), technical certificate (TECH CERT), bachelor's degree (BACHELOR), master's degree (MASTERS), and doctorate degree (DOCTORATE). The survey asked employers to choose the minimum educational level required for each job type in the firm.

Chart 3.3 shows the breakdown of the percent of existing jobs in the new economy sectors that require each education level. This chart reveals that 63.7 percent of existing jobs require a *bachelor's degree or higher*, with the largest percent of employees at the bachelor's level. Individuals who have completed less than a four-

year college degree currently fill nearly 40 percent of all existing jobs in the new economy; however half of these jobs (21.5 percent) require some additional education after high school just short of a bachelor's degree. Higher education, as defined by additional education beyond high school, is an integral part of employment in the new economy.

Chart 3.3
EDUCATION REQUIREMENTS FOR NEW ECONOMY JOBS (AS PERCENT OF TOTAL)
(IT, SCIENCE, HEALTH AND BUSINESS & FINANCE CLUSTERS)

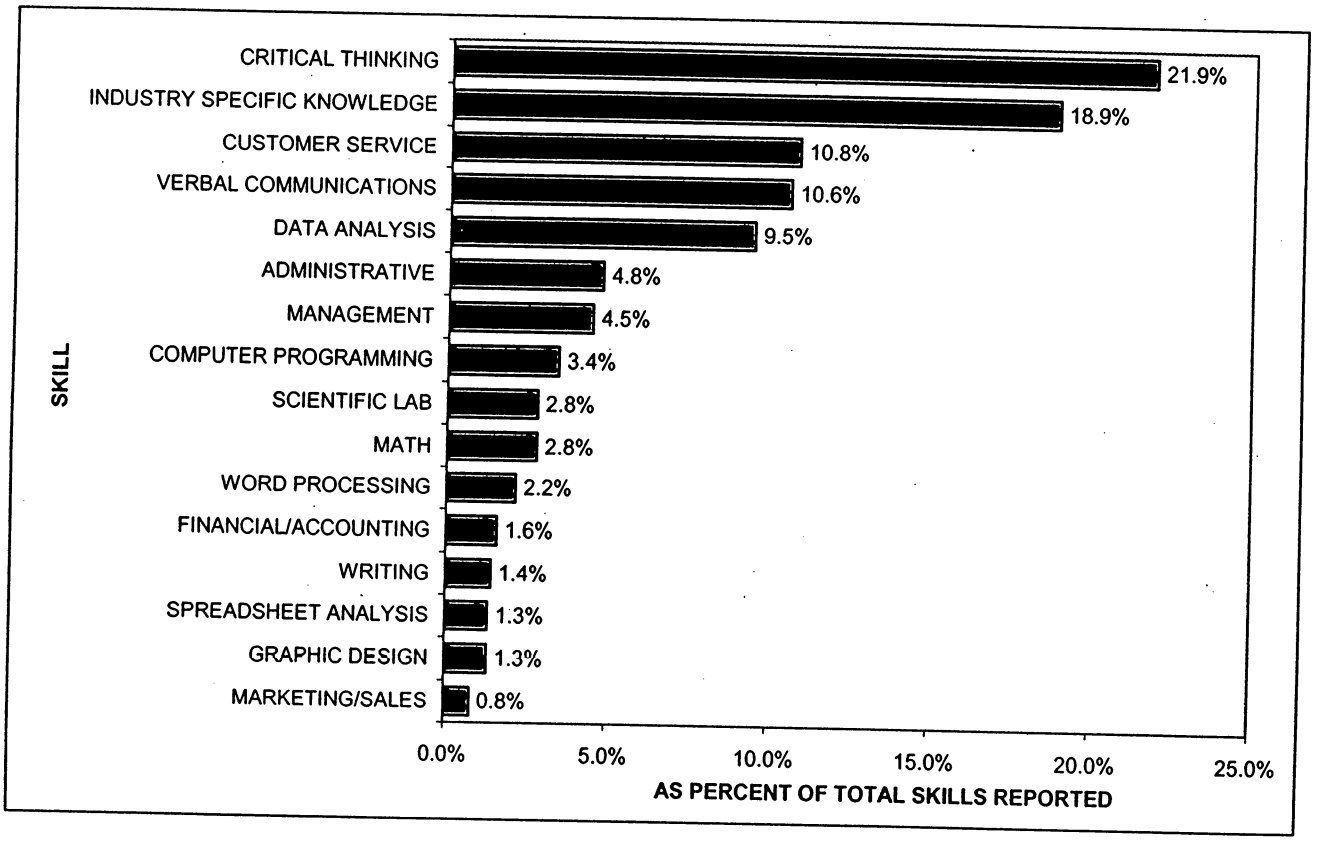


Another important characteristic of employment in the new economy is the type of skill required for each job type. Employers were asked to pick the three most critical skills for each job type from a list provided on the survey. Chart 3.4 below depicts the most frequently reported skill requirements as a percent of the total skills reported.

Across all four industry clusters, the top three skill requirements are identified as *Critical Thinking, Industry Specific Knowledge* (experience in the field) and *Customer Service.* The next two most frequently reported skill requirements are *Verbal Communication* and *Data Analysis.* While most people assume that new economy sectors required considerable "hard skills," the survey results bring attention to the equally important need for "soft skills," which has been noted in other studies of

changing employment requirements (Moss and Tilly, 2001). The emphasis on *Verbal Communication* may pose special challenges for non-English speakers and for those for whom English is not their first language.

Chart 3.4
SKILL REQUIREMENTS FOR NEW ECONOMY JOBS
(IT, SCIENCE, HEALTH AND BUSINESS & FINANCE CLUSTERS)



D. RECRUITMENT METHODS OF NEW ECONOMY FIRMS

Information on the ways in which firms find and hire employees is also important to job seekers or organizations focused on workforce development. Therefore, a question was included on the survey related to the hiring practices of Cambridge firms. The question asked firms to pick the two most successful methods for finding new employees. This information is useful in understanding how Cambridge residents can access existing jobs as well as new jobs created by these firms. Table 3.3 below lists the most frequently reported recruitment methods. Most employers in the sample rely on recommendations from current employees and job advertisements in the newspaper; these are the two most frequently reported methods of employee recruitment. The fact that firms rely on referrals of applicants from existing employees highlights the importance of personal contacts in a firm or industry to the success of

the applicant in obtaining a job. In addition, the use of the Internet and temporary employment firms is worthy of note.

TABLE 3.3
FREQUENCY OF RECRUITMENT METHODS
REPORTED BY NEW ECONOMY FIRMS IN CAMBRIDGE

RECRUITMENT METHOD	PERCENT OF TOTAL
RECOMMENDATION FROM CURRENT EMPLOYEES	31.8%
NEWSPAPER	27.3%
INTERNET	19.2%
PROFESSIONAL RECRUITERS (TEMP & CONTRACT)	11.1%
COLLEGE CAREER CENTERS	4.5%
CAREER SOURCE (IN CAMBRIDGE)	1.5%
JOB FAIR	1.5%
BOSTON SOCIETY OF ARCHITECTS LISTING	1.0%
UNSOLICITED RESUMES	0.5%
BOSTON SOCIETY OF ARCHITECTS LISTING	0.5%
EMPLOYMENT AGENCIES	0.5%
CAMBRIDGE EMPLOYMENT PROGRAM	0.5%
SIGN IN WINDOW	0.5%

E. JOB GROWTH IN THE NEW ECONOMY

The survey asked employers to project the number of new hires they expect to make for each job type over the next five years. (The growth rate for each job type was determined based upon the existing number of jobs and the projections for each job type reported by employers.) Job growth may be understated since this question was not completed on every survey. A list of job types with growth rates over 50 percent across all four industry clusters is included in Table 3.4 below.

In Table 3.4, in fact, none of the top ten *most frequently reported* job types, except for Architect/Planner, show up in the top ten list of strongest growth rates. There is another interesting pattern in the projected growth rates related to the *nature of the work* for the top ten job types with the highest growth rates. The first five job types with the strongest growth rates are positions in medical and health industries. If the list is expanded to the top ten job types, eight of the ten are in the medical industry. In summary, firms in the medical and health industries anticipate stronger growth in the coming years compared to firms in the other three industry clusters.

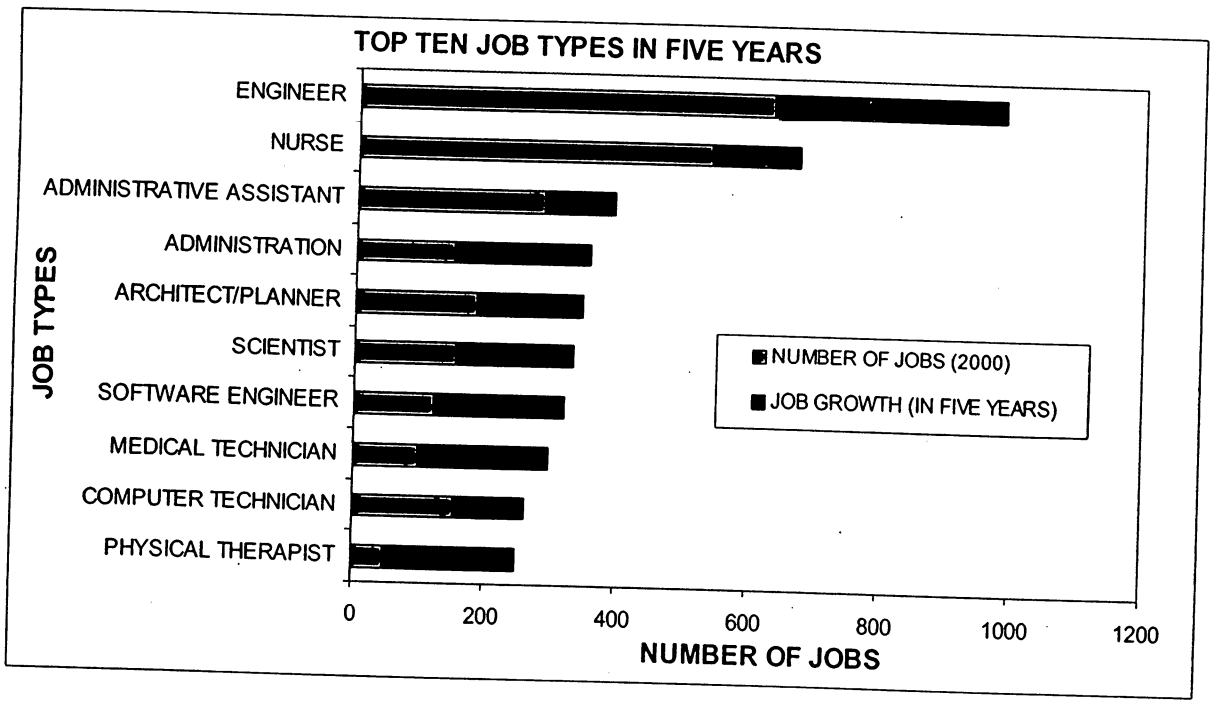
TABLE 3.4: FIVE YEAR GROWTH RATES
NEW ECONOMY JOB TYPES WITH GROWTH RATES OF 50% OR MORE
(IT, SCIENCE, HEALTH AND BUSINESS & FINANCE CLUSTERS)

JOB TYPE	GROWTH RATE
NUTRITIONIST	91.0%
MEDICAL RECORDS TECHNICIAN	91.0%
PHYSICIAN ASSISTANT	90.9%
SOCIAL WORKER	86.3%
PHARMACIST	86.1%
PSYCHOLOGIST	83.2%
ARCHITECH/PLANNER	82.7%
PHYSICAL THERAPIST	80.4%
PERSONNEL	80.1%
OCCUPATIONAL THERAPIST	75.6%
FOOD SERVICES	74.1%
DIETARY SERVICES	70.8%
PURCHASING	68.8%
CUSTOMER SERVICE	68.7%
HOUSKEEPING	67.4%
MEDICAL TECHNICIAN	66.8%
GIS	66.7%
ACTIVITIES COORDINATOR	66.7%
FACILITIES OPERATION	64.5%
SOFTWARE ENGINEER	62.3%
EXECUTIVE MANAGEMENT	61.5%
ADMINISTRATION	58.3%
ANALYST	57.8%
CONSULTANT	56.6%
ACCOUNTANT	55.2%
SCIENTIST	53.5%
SALES	52.9%
FINANCIAL ANALYST	50.0%
RESEARCH - NON SCIENTIFIC	50.0%

Each job type can also be evaluated based on the total number of jobs it will represent in five years, based on the existing employment numbers and growth projections reported by employers on the survey. This measure is more telling than pure growth rates because while this measure takes into consideration the projected growth rate, it combines existing employment with future growth. The following bar graph (Chart 3.5) indicates which job types are anticipated to employ the greatest number of people in five years.

This graph depicts the way in which job growth over the next five years changes the share of total employment for each job type across all industry clusters. For example, *Medical Technicians* represent a smaller portion of total employment than *Computer Technicians* in 2000, yet in five years they are projected to outstrip *Computer Technicians*. Given their strong base numbers in 2000 and additional strong projected growth rates, *Engineers* and *Nurses* will likely maintain their presence in the Cambridge labor market in the near future.

Chart 3.5



II. Education and Skill Characteristics of Industry Clusters

Specific trends for each industry cluster are not discernable in the data reviewed in the previous section. While the new economy predominantly demands a bachelor's degree combined with *Industry Specific Knowledge, Critical Thinking* and *Customer Service* skills, these characteristics are generalized across many job types and industries. This section reviews the data to describe industry specific education and skill requirements and to develop a more detailed analysis of the survey's findings.

The following Table 3.5 is a summary of the most frequently reported education and skill requirements for each industry cluster.

TABLE 3.5: SUMMARY TABLE OF TOP EDUCATION AND SKILL REQUIREMENTS BY INDUSTRY CLUSTER

	IT	SCIENCE	HEALTH	BUSINESS/FINANCE
EDUCATION	BACHELOR	BACHELOR	ASSOCIATE	BACHELOR
SKILL 1	CRITICAL THINKING	COMPUTER PROGRAMMING	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE
SKILL 2	INDUSTRY SPECIFIC KNOWLEDGE	INDUSTRY SPECIFIC KNOWLEDGE	CUSTOMER SERVICE	CRITICAL THINKING
SKILL 3	COMPUTER PROGRAMMING	DATA ANALYSIS	INDUSTRY SPECIFIC KNOWLEDGE	VERBAL COMMUNICATION

A. INFORMATION TECHNOLOGY CLUSTER

Education

Survey data for the IT sector shows that a bachelor's degree is more important in this sector than for the new economy overall. In the IT cluster 83.9 percent of employees are required to have a bachelor's degree or more, a majority of whom (76.9 percent) need only a bachelor's degree. In comparison, only 38.7 percent of employees *across all four clusters* required this degree.

Skill

The distribution of skills required for all of job types in the sector are listed in Table 1 in Appendix D. (Similar tables are included in the same appendix for the other three industry clusters as well, so that information can be compared between the four.) The Table describes the top three reported skill requirements for all job types in the cluster, which are *Critical Thinking*, *Industry Specific Knowledge* and *Computer Programming* (in that order and outlined in red ink). Beyond the core skills for the IT cluster, *Customer Service, Verbal Communication* and *Writing* are moderately important across all job types in the cluster.

In Table 1, Appendix D, there are columns for each skill characteristic and a column titled "Technical Index." The technical index (column highlighted in blue ink) is a percentage that measures the total technical skill required for each job type. The technical index divides the total number of reported technical skills needed for a job type by the total number of skills required for that job type. The columns highlighted in yellow ink are designated as technical skills. Surprisingly, only six of the 32 job

types in the cluster have technical indices[5] over 50 percent. The overall technical index for all job types in the IT cluster is 24.2 percent, which is higher than the technical indices for the health and business & finance clusters, but lower than the science and research cluster (56.3 percent).

Top Ten Job Types for the Cluster

The data collected from IT firms on education and skill requirements for specific job types is reported in Table 3.6 on page 20 (along with summary tables for the other clusters). A bachelor's degree is required by each top ten job type, whereas in other clusters there is more variation in the level of education required for the ten most frequently reported positions. This suggests that educational credentials are critical for employment in IT firms. Table 3.6 also lists the specific skill requirements for the ten most frequently reported job types in the IT cluster. In general, the job types follow the general trends for the cluster. One surprise is that for the *Administrative Assistant* position, *Spreadsheet Analysis* shows up in the top three skill requirements. Although this position is typically considered entry-level, spreadsheet skills are a top priority to employers in this cluster. *Administrative Assistants* in this sector are also expected to have a bachelor's degree, which is a more stringent educational requirement compared to *Administrative Assistants* the other three industry clusters.

In summary, although the IT cluster has high educational requirements, employers report only a handful of positions which require concentrated technical skills.

B. SCIENCE AND RESEARCH CLUSTER

Education

The most frequently reported educational requirement for all the job types in this cluster is a bachelor's degree (31.3 percent). Unique to this cluster's report, employers report the greatest demand for employees with a doctorate degree (29.1 percent). In comparison, the other three clusters require less than five percent of employees to have a doctorate degree across each cluster. Although there are more employment positions in this cluster that allow for an education below a bachelor's, nearly 50 percent of the total jobs in this cluster require a master's or doctorate degree, suggesting a more stratified educational environment.

[5] The percent of technical skill required for the IT cluster would be higher if *Industry Specific Knowledge* was included as a technical skill; in the IT cluster "work experience" or knowledge may actually be technical skill. For example, the Programmer job type would have a technical index over 50% if *Industry Specific Knowledge* was included. It is not included because firms were not asked about the nature of this skill category.

Skill

The top three skill requirements for the cluster shown in Table 2 of Appendix D are *Computer Programming, Industry Specific Knowledge*, and *Data Analysis* (outlined in red ink.) The cluster has a technical index of 56.3 percent, the highest of all four clusters, which suggests that employees are required to have significant technical skills. It is interesting to note that *Computer Programming* is one of the most frequently reported skill requirements in the science cluster. A review of Table 2 in Appendix D shows that, in addition to the top three skill requirements across the science cluster, *Scientific Lab* skills and *Verbal Communication* are also important, but *Writing* skills are in very low demand for the reported job types (0.9 percent of employees).

The table also reports 15 job types with technical indices over 50 percent. These job types are as follows: *Engineer, Researcher, Data Analyst, Scientist, Manufacturer, Quality Assurance, Scientific Lab, Non-scientific Researcher, Accountant, Software Engineer, Finance, Financial Analyst, Facilities Operations, Account Executives* and *Attorney.* Employers in the science and research cluster seem to place more emphasis on technical skills compared to the IT cluster, which reported only six job types with a technical index over 50 percent. Thus, employees need to be well prepared with the skills highlighted in yellow ink in Table 2 of Appendix D to be able to obtain jobs in this cluster.

Top Ten Job Types for the Cluster

Table 3.7 on page 20 summarizes the characteristics of the top ten job types in the cluster. This cluster shows more stratification in the required education levels for the top ten job types compared to the IT cluster. In fact, three of the ten job types (*Administrative Assistant, Project Technician and Manufacturer*) require less than a bachelor's degree.

C. HEALTH CLUSTER

Education

Across the industry cluster the most frequently reported educational requirement is an associate's degree (28.2 percent), closely followed by a bachelor's degree (28.1 percent). Compared to the IT and Science & Research clusters, this finding suggests that the cluster provides more opportunity for workers with less education.

Skill

Table 3 in Appendix D shows that the top three skill requirements (outlined in red ink) for the health cluster are *Critical Thinking, Customer Service* and *Industry Specific Knowledge*, followed by an emphasis on *Verbal Communication*. This cluster reports a low demand (1.0 percent or less of employees) for *Computer Programming, Finance/Accounting, Graphic Design, Scientific Lab, Spreadsheet Analysis, Word Processing* and *Writing* skills. It also has the lowest overall technical index (8.3 percent) and reports only two job types with a technical index over 50 percent.

Top Ten Job Types for the Cluster

This cluster has the highest number of job types requiring **less** than a bachelor degree in the top ten list (see Table 3.8 on page 21); the majority of jobs (57.7 percent) in the cluster require less than a bachelor's degree. The list does not contain any surprises about the cluster and confirms the important presence of nurses in the new economy, since this is the number one reported job type for the cluster. Overall this cluster has the lowest educational and skill requirements across all job types generated by firms in health industries, compared to firms in the other three clusters.

D. BUSINESS & FINANCE CLUSTER

Education

Employers in the business and finance cluster reported that 70.9 percent of employees across all job types are required to have a bachelor's degree or higher. Approximately 25 percent of employees in this cluster are required to have a master's degree, which is the highest percentage reported in the master's degree category compared to the other industry clusters. Therefore, a master's degree seems to be an important element for employment in this cluster.

Skill

The top three skill requirements (outlined in red ink on Table 4 in Appendix D) across all job types in this cluster are *Industry Specific Knowledge, Critical Thinking* and *Verbal Communication*, closely followed by *Management* skill. *Administrative, Customer Service* and *Data Analysis* skills were also demanded by employers. Once again, there is a surprising lack of demand for *Writing* skills, in that only 2.3 percent of all employees in the cluster are expected to possess this skill.

Top Ten Job Types for the Cluster

The specific job types (listed in Table 3.9 on page 21) for this cluster are professional positions in the engineering, design, management and finance industries. In this cluster, the Administrative Assistant and Bank Teller positions allowed for an education below bachelor's degree. One interesting comparison between the *Engineer* positions in the Business & Finance (B&F) and the Science & Research clusters is that in the B&F cluster an engineer is most frequently reported to have a bachelor's instead of a doctorate degree. However, the *Management* position in this cluster requires a master's degree, whereas in the Health cluster management employees are hired with a bachelor's degree.

TABLE 3.6: TEN MOST FREQUENTLY REPORTED JOB TYPES IN THE IT CLUSTER

IT JOB TYPE	#	EDUCATION	SKILL 1	SKILL 2	SKILL 3
WEB DESIGNER	105	BACHELOR	COMPUTER PROGRAMMING	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE
SOFTWARE ENGINEER	90	BACHELOR	COMPUTER PROGRAMMING	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE
ACCOUNT EXECUTIVE	60	BACHELOR	WRITING	CUSTOMER SERVICE	VERBAL COMMUNICATION
TECHNICIAN	45	BACHELOR	INDUSTRY SPECIFIC KNOWLEDGE	CRITICAL THINKING	COMPUTER PROGRAMMING
ADMINISTRATIVE ASSISTANT	45	BACHELOR	WORD PROCESSING	SPREADSHEET ANALYSIS	CRITICAL THINKING
ACCOUNTANT	39	BACHELOR	FINANCE	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE
CONSULTANT	28	BACHELOR	MANAGEMENT	GRAPHIC DESIGN	COMPUTER PROGRAMMING
PROJECT MANAGER	27	BACHELOR	VERBAL COMMUNICATION	ADMINISTRATION	CUSTOMER SERVICE
SALES	24	BACHELOR	CUSTOMER SERVICE	MARKETING	VERBAL COMMUNICATION
EXECUTIVE MANAGEMENT	23	BACHELOR	MANAGEMENT	CRITICAL THINKING	WRITING

TABLE 3.7: TEN MOST FREQUENTLY REPORTED JOB TYPES IN THE SCIENCE AND RESEARCH CLUSTER

SCIENCE JOB TYPE	#	EDUCATION	SKILL 1	SKILL 2	SKILL 3
ENGINEER	491	DOCTORATE	DATA ANALYSIS	INDUSTRY SPECIFIC KNOWLEDGE	CRITICAL THINKING
RESEARCH	172	BACHELOR	DATA ANALYSIS	INDUSTRY SPECIFIC KNOWLEDGE	SCIENTIFIC LAB
ADMINISTRATIVE ASSISTANT	145	HIGH SCHOOL	ADMINISTRATIVE	WORD PROCESSING	VERBAL COMMUNICATION
DATA ANALYST	143	BACHELOR	DATA ANALYSIS	INDUSTRY SPECIFIC KNOWLEDGE	CRITICAL THINKING
SCIENTIST	126	BACHELOR	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE	DATA ANALYSIS
PROJECT TECHNICIANS	107	VOC ED	INDUSTRY SPECIFIC KNOWLEDGE	SCIENTIFIC LAB	COMPUTER PROGRAMMING
MANUFACTURER	87	HIGH SCHOOL	MATH	INDUSTRY SPECIFIC KNOWLEDGE	CRITICAL THINKING
QUALITY ASSURANCE	31	BACHELOR	DATA ANALYSIS	WRITING	CRITICAL THINKING
EXECUTIVE MANAGEMENT	26	DOCTORATE	MANAGEMENT	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE
PROGRAMMER	24	BACHELOR	COMPUTER PROGRAMMING	DATA ANALYSIS	VERBAL COMMUNICATION

TABLE 3.8: TEN MOST FREQUENTLY REPORTED JOB TYPES IN THE HEALTH CLUSTER

HEALTH JOB TYPE	# OF JOBS	EDUCATION	SKILL 1	SKILL 2	SKILL 3
NURSE	538	BACHELOR	CRITICAL THINKING	CUSTOMER SERVICE	INDUSTRY SPECIFIC KNOWLEDGE
NURSE ASSISTANT	195	HIGH SCHOOL	CRITICAL THINKING	CUSTOMER SERVICE	DATA ANALYSIS
PHYSICIAN	111	DOCTORATE	CUSTOMER SERVICE	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE
MANAGEMENT	109	BACHELOR	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE	MANAGEMENT
MEDICAL TECHNICIAN	99	VOC ED	INDUSTRY SPECIFIC KNOWLEDGE	ADMINISTRATIVE	CUSTOMER SERVICE
ADMINISTRATION	88	BACHELOR	ADMINISTRATIVE	INDUSTRY SPECIFIC KNOWLEDGE	MANAGEMENT
PHYSICAL THERAPIST	49	BACHELOR	CRITICAL THINKING	CUSTOMER SERVICE	VERBAL COMMUNICATION
ADMINISTRATIVE ASSISTANT	37	ASSOCIATE	VERBAL COMMUNICATION	CUSTOMER SERVICE	ADMINISTRATIVE
DIETARY SERVICES	33	HIGH SCHOOL	VERBAL COMMUNICATION	CUSTOMER SERVICE	CRITICAL THINKING
OCCUPATIONAL THERAPIST	33	BACHELOR	CRITICAL THINKING	VERBAL COMMUNICATION	CUSTOMER SERVICE

TABLE 3.9: TEN MOST FREQUENTLY REPORTED JOB TYPES IN THE BUSINESS & FINANCE CLUSTER

BUSINESS & FINANCE JOB TYPE	# OF JOBS	EDUCATION	SKILL 1	SKILL 2	SKILL 3
ARCHITECT/PLANNER	185	MASTER	INDUSTRY SPECIFIC KNOWLEDGE	MANAGEMENT	DATA ANALYSIS
ENGINEER	127	BACHELOR	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE	MATH
MANAGEMENT	76	MASTER	MANAGEMENT	INDUSTRY SPECIFIC KNOWLEDGE	VERBAL COMMUNICATION
ADMINISTRATIVE ASSISTANT	58	ASSOCIATE	ADMINISTRATIVE	WORD PROCESSING	VERBAL COMMUNICATION
PROJECT MANAGER	50	BACHELOR	CUSTOMER SERVICE	INDUSTRY SPECIFIC KNOWLEDGE	VERBAL COMMUNICATION
ACCOUNTANT	43	BACHELOR	ADMINISTRATIVE	FINANCE	MATH
TELLER	39	HIGH SCHOOL	CUSTOMER SERVICE	VERBAL COMMUNICATION	INDUSTRY SPECIFIC KNOWLEDGE
EXECUTIVE MANAGEMENT	32	BACHELOR	MANAGEMENT	INDUSTRY SPECIFIC KNOWLEDGE	CRITICAL THINKING
GRAPHIC	31	BACHELOR	GRAPHIC	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE
CONSULTANT	26	MASTER	CRITICAL THINKING	INDUSTRY SPECIFIC KNOWLEDGE	DATA ANALYSIS

SECTION 4: SUMMARY AND CONCLUSION

The data collected through the survey of new economy employers in Cambridge provides a wealth of information about employment in these firms. Several key trends stand out as the City considers the policy implications of the survey results.

KEY JOB TYPES

New economy jobs are important to the Cambridge economy. In 1998, 40% of total employment in Cambridge was in firms in the four new economy industry clusters surveyed: Information Technology, Science, Health, and Business & Finance (see Chart 3.1, page 7). Across these four clusters the most significant future employment is projected to occur in the positions of *Engineer, Nurse, Administration (including Administrative Assistant), Architects/Planner, Scientist, Software Engineer, Medical Technician, Computer Technician,* and *Physical Therapist.* In addition, the survey found that the job types in the new economy with the largest growth rates tend to be in the medical field.

EDUCATION

Many of the job types described in this report require technical or educational training beyond the high school level and some even beyond a four-year college degree. Higher education is an integral part of employment in the new economy. Sixty-four percent of employees in job types reported require an education level of bachelor's degree or higher (see Chart 3.3, page 10).

A few prominent findings from the survey results stood out in the education data on industry clusters. For example, the IT sector has strong and consistent educational requirements (bachelor's degree) across all job types in the cluster, while the Science & Research cluster has the highest number of job types requiring a doctorate degree, but also has opportunities at lower educational levels. The health cluster allows the most room for workers with less than a bachelor's degree, but often requires specific skill certifications. And finally, a master's degree is important in the Business & Finance cluster.

SKILL

The new economy places a skill emphasis on the ability to think critically, obtain skills specific to an industry or job and excel in customer service. Employers also voiced a need for verbal communication and data analysis skills. While most people assume

that new economy jobs require considerable "hard skills," the survey results also focuses attention on the equally important need for having "soft skills" (verbal communication, customer service). The fact that the top reported skill requirement for the new economy is *Critical Thinking* is interesting given the private sector's tendency to train employees in job specific skills and not in a general area like *Critical Thinking.*

TRAINING AND ADVANCEMENT (RECRUITMENT)

The survey suggests that employers are willing to train employees in certain job types but workers need to bring certain skills to a job, especially for higher skilled positions. This is seen in the list of characteristics for the top ten job types (Table 3.1 page 6). In the list of top ten job types across the new economy, those that report more than 50 percent of employees have access to training, generally require less than a bachelor's degree and are generally considered to be lower skilled positions. Typically, employers report offering more training to higher level positions, which runs counter to the findings from Cambridge employers (for new economy firms) who seem to offer more training at the lower end of the job ladder.

POLICY IMPLICATIONS FOR THE EXISTING WORKFORCE

For Cambridge residents seeking to transition from old to new economy jobs, the survey points to the importance of having a college education and the probable need for some skills training. Survey results show that 63.7 percent of job types reported require an education level of bachelor's degree or higher and the skills of *Industry Specific Knowledge, Computer Programming, Critical Thinking* and *Data Analysis* were consistently reported across the four industry clusters.

Training is necessary to help workers already in the new economy jobs to gain access to advancement opportunities. Although nine of the top ten most frequently reported job types across the four industry clusters reported that more than 75 percent of employees had advancement opportunities, the survey found relatively lower levels of employees receiving employer-sponsored training. This points to the need for workers to gain training for advancement from sources outside the workplace. Additionally, incentives should be provided for employers to offer more training to employees at all levels.

Short-term training may best apply to the job types described in the survey data that require less education and skill. These job types seem to exist in the greatest numbers in the health cluster, and entry-level jobs across all clusters. The survey data also helps to target a few basic job types that have less stringent skill or education

requirements and are expected to be on the top ten list of job types in five years. For example, training programs designed for *Computer* and *Medical Technicians* would help to prepare Cambridge workers for future employment demand in these job types. Further studies of a specific industry or job type would help to identify exact skill and education requirements. In an effort to confirm areas of skill where training is needed, formal conversations or partnerships with local employers may help to identify areas where they are suffering labor shortages for both skilled and unskilled labor.

Long-term training is best implemented through additional education in a traditional education setting or through the community college system in the United States, which has become a first-rate job training venue and labor market intermediary over the last ten years. Many of the job types identified in the survey require substantial education and experience, which are better addressed by the recommendations in the next section on the future workforce. Regardless of the length of training that is encouraged, the design of any job training program should include a component of on-the-job work experience or internships to address the need for *Industry Specific Knowledge,* reported as one of the top three skill requirements across all four industry clusters.

POLICY IMPLICATIONS FOR THE FUTURE WORKFORCE

Education and training policies are critical for meeting the employment needs of the new economy and for providing opportunities for job seekers. The survey results reveal a need for higher education (a bachelor's degree), especially in the IT and science clusters. While public education needs to continue its focus on transitioning students into higher educational institutions, educational professionals could also emphasize specific areas of study that coincide with the future demands of the labor market. The job types with the greatest presence in Cambridge's future economy are medical and scientific in nature. Reviewing Chart 3.3 on page 10 shows that 8 of 10 top ten **projected** job types for the new economy in five years are in medical or technical positions: *Engineer, Nurse, Architect/Planner, Scientist, Software Engineer, Medical Technician, Computer Technician,* and *Physical Therapist.* Thus, coursework in the study of computer science (computer programming is a top skill in the science and IT clusters) and science-based fields should be heavily emphasized and encouraged at the high school, associate and college levels.

Education at the K-12 level is a critical component of the preparation of the future workforce for Cambridge new economy firms. In order to enter into the fields described above at an associate or college level, students need a strong grounding in

literacy and numerical skills to be able to successfully complete academic training in these fields. In addition, *Critical Thinking* skills (problem solving, analysis) need to be defined and taught in the public education system to prepare future employees, especially since it is the number one skill demanded by new economy employers.

One debate within the education field is whether high school education should offer "work preparation" classes in order to help graduates (not planning on getting a higher education) find jobs after graduation. Results from this survey suggest that on-the-job experience is very valuable in imparting *Industry Specific Knowledge.* Once again, on-the-job training or internship opportunities at the high school level could help Cambridge residents find employment in job types requiring *Industry Specific Knowledge.*

This survey of new economy firms in Cambridge offers a wealth of information that we hope will be utilized to more specifically formulate education and workforce policy. We hope that this initial effort will form a basis for future surveys and discussions between Cambridge employers, the educational community, workforce professionals, and other policy makers focused on the Cambridge employment market and jobs for Cambridge residents.

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APPENDIX A

1998 NEW ECONOMY EMPLOYMENT BASE IN CAMBRIDGE, MASSACHUSETTS

SIC CODE	INDUSTRY GROUPS	1998 (EMP.COUNT)	# OF BUSINESSES
INFORMATION TECHNOLOGY RELATED			
48	Communication - TCPU	511	18
504	Professional & Commercial Equipment - Wholesale	1,800	22
737	Computer and Data Processing Services	11,981	153
78	Motion Pictures - Services	339	32
	SUB TOTAL	**14,631**	**225**
SCIENCE RELATED			
283	Drugs - Mnfct.	1,835	13
873	Research and Testing Services	7,823	104
	SUB TOTAL	**9,658**	**802**
HEALTH RELATED (Over 10 employees)			
801	Medical Offices & Clinics- Health Services	1,085	305
802	Dental Offices & Clinics- Health Services	266	71
804	Health Practitioners Offices- Health Services	271	250
805	Nursing/Personal Care Offices- Health Services	574	11
806	Hospitals- Health Services*	2,810	18
808	Home Health Care Services	255	4
809	Health Allied Services	189	11
836	Residential Care Services	1,681	9
807	Medical/Dental Laboratories- Health Services*	570	6
	SUB TOTAL	**7,701**	**802**
BUSINESS & FINANCE RELATED			
27	Printing & Publishing - Mnfct.	1,065	108
60	Depository Institution - FIRE	1,505	48
731	Advertising - Services	70	18
733	Mailing/Reproduction - Service	435	82
736	Personnel Supply Services	2,685	31
871	Eng & Architectural Services	3,161	194
874	Management/Public Relations- Services	4,685	198
	SUB TOTAL	**13,606**	**679**
	SECTOR TOTALS	**45,596**	**1,706**
CAMBRDIGE TOTALS (EMPLOYMENT AND BUSINESSES)		**113,059**	**5,051**

*1993 employment count due to unavailability of 1998 data for confidentiality reasons.

APPENDIX B

CITY OF CAMBRIDGE • EXECUTIVE DEPARTMENT

Robert W. Healy, City Manager *Richard C. Rossi, Deputy City Manager*

November 2, 2000

Dear Chief Executive Officer:

The City of Cambridge is conducting a study of the changing Cambridge labor market in three of the city's largest and fastest growing industry groups: business and finance, information technology and biotechnology, science and health. The purpose of the study is to gain information about existing and future employment opportunities in these industries. We hope the results of this study will also be helpful to you as you seek employees in this challenging labor market.

We have identified your company as belonging to one of these industry groups and ask for your help in providing the city with information about your existing and future workforce needs. We have enclosed an Employment Survey to be completed by your Director of Human Resources (or other appropriate person in your firm) and returned to us. In the survey you are asked to identify your company's job types in Cambridge, educational and skill requirements, and areas of anticipated growth.

The survey has been designed to minimize the amount of time needed to complete it. The survey can be completed in hard copy and returned to the city in the enclosed self-addressed envelope, or completed on line at ci.cambridge.ma.us/~CDD. Elaine Madden of the city's Economic Development staff at (617) 349-4618 can answer any questions you may have.

Thank you in advance for your assistance. Please feel free to contact my office if I can be of any assistance at (617) 349-4300.

Very truly yours,

Robert W. Healy
City Manager

Cc: Director of Human Resources
Attachment

CITY OF CAMBRIDGE – EMPLOYMENT SURVEY

Section 1: Contact Information & Company Profile

Company Name: _____

Name & Title of person completing survey: _____ **Phone:** _____

Annual revenue last reporting period (optional) **$** _____ **Additional locations:** Y or N* **Year established:** _____

Description of business: _____

_____

Section 2: Employment Profile of Company

1. What are the types of jobs that currently exist at your company **in Cambridge**? Please estimate the salary range and number of employees in each job type. *For your convenience, you can choose job types from the list provided at the end of the survey or attach your own existing list in a similar format.*

Please write in job title	Salary Range *(please check one)*						Number of employees **in Cambridge**
	<$20k	$20 - 40k	$40 - 60k	$60 - 80k	$80 - 100k	Over $100k	
Job Type 1:							
Job Type 2:							
Job Type 3:							
Job Type 4:							
Job Type 5:							
Job Type 6:							
Job Type 7:							
Job Type 8:							
Job Type 9:							
Job Type 10:							
Job Type 11:							
Job Type 12:							
Job Type 13:							
Job Type 14:							
Job Type 15:							
						TOTAL NUMBER OF EMPLOYEES **IN CAMBRIDGE**	

* Please indicate if you have company locations outside Cambridge. **However, this survey is only asking for information on your Cambridge employment.**

2. What are the **educational requirements** for each of the job types referenced above? *Please check one box.*

	Less than high school diploma	High school diploma	Vocational training related to job type	Associate's degree (2-year)	Bachelor's degree (4-year)	Master's degree	*Technical Certificate	Doctoral degree	Other
Job Type 1									
Job Type 2									
Job Type 3									
Job Type 4									
Job Type 5									
Job Type 6									
Job Type 7									
Job Type 8									
Job Type 9									
Job Type 10									
Job Type 11									
Job Type 12									
Job Type 13									
Job Type 14									
Job Type 15									

**Required in addition to a college degree.*

3. What are the most important **skill requirements** for the employees that fill each job type? *Please check three or fewer boxes.*

	Administrative	Computer programming	Critical thinking	Customer service	Data analysis	Financial or accounting	Graphic design software	Industry-specific experience	Management	Marketing/Sales	Math skills	Scientific lab skills	Spreadsheet analysis	Verbal communication	Word processing	Writing	Other:
Job Type 1																	
Job Type 2																	
Job Type 3																	
Job Type 4																	
Job Type 5																	
Job Type 6																	
Job Type 7																	
Job Type 8																	
Job Type 9																	
Job Type 10																	
Job Type 11																	
Job Type 12																	
Job Type 13																	
Job Type 14																	
Job Type 15																	

4. For which job types do you offer in-house training programs for new hires who do not meet your skill or educational requirements? *Please circle or underline the number below that refers to the job type.*

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

5. For the job types identified in question 4, please indicate if the training you provide is technical and job-related (T), generic (G) (for example basic office skills), or both (B). *Please enter the most accurate letter next to each job type.*

1____2____3____4____5____6____7____8____9____10____11____12____13____14____15____

6. Which job types allow for advancement within the firm? *Please circle or underline as many as apply.*

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

7. Which sources have been most useful in recruiting new employees? *Please check two.*

___ Newspapers
___ Job fairs
___ Recommendations from current employees
___ Internet job boards
___ Cambridge Employment Program
___ College career centers
___ Temporary employment agencies
___ Career Source
___ Other:

8. What is your best estimate of the percent of your Cambridge-based employees that are residents of Cambridge? *Please circle or underline one category.*

0 – 10% 11 – 20% 21 – 30% 31 – 40% 41 – 50% 51 – 60% 61 – 70% 71 – 80% 81 – 90% 91 – 100%

Section 3: Growth Rate Information

9. Please estimate the number of new jobs that will be created in each job type **in Cambridge** over the next 5 years.

	Number of New Jobs
Job Type 1	
Job Type 2	
Job Type 3	
Job Type 4	
Job Type 5	
Job Type 6	
Job Type 7	
Job Type 8	
Job Type 9	
Job Type 10	
Job Type 11	
Job Type 12	
Job Type 13	
Job Type 14	
Job Type 15	

Thank you for your time in completing this survey!

Please call Elaine Madden at 349-4618 with any questions regarding the survey or if you would prefer to complete it over the phone. You may also go to http://www.ci.cambridge.ma.us to complete the survey on-line and then email it to: emadden@ci.cambridge.ma.us.

CITY OF CAMBRIDGE – EMPLOYMENT SURVEY

INFORMATION TECHNOLOGY INDUSTRY SECTOR

The following is a list of suggested job types to assist you in completing the enclosed Employment Survey. Please provide your company's particular job types to the list on the survey.

Account Executive
Administrative Assistant
Bookkeeping & Accounting
Brokers
Building and Maintenance Staff
Commercial Artist
Computer Programmer
Customer Service Representative
Data Entry
Data Warehouse Developer
Database Analyst
Desktop Publisher
Drivers
Electrical Engineer
Financial Analyst
Graphic Designer
Hardware Technician
Management
Management Analyst
Manager – General Office
Marketing Analyst
Mechanical Engineer
Medical Lab Assistant
Medical Lab Technician
Medical Researcher
Network Technician
Packagers, Shipping & Receiving
Personnel Staff
Personnel Supervisor
Project Manager
Public Relations Specialist
Scientific Lab Assistant
Scientific Lab Technician
Scientific Researcher - Biology, Chemistry
Software Technician
Statistical Analyst
Technical Service Manager
Technical Writer
Telemarketer
Web Designer

The following is a list of suggested job types to assist you in completing the enclosed Employment Survey. Please provide your company's particular job types to the list on the survey.

Account Executive (including sales)
Administrative Assistant
Bookkeeping & Accounting
Computer Technician
Customer Service Representative
Data Entry
Database Analyst
Financial Analyst
Graphics Designer
Management
Management Analyst
Manager – General Office
Marketing Analyst
Medical Lab Assistant
Medical Lab Technician
Medical Researcher
Personnel Staff
Personnel Supervisor
Public Relations Specialist
Scientific Lab Assistant
Scientific Lab Technician
Scientific Researcher - Biology, Chemistry
Statistical Analyst
Web Site Manager/Designer

The following is a list of suggested job types to assist you in completing the enclosed Employment Survey. Please provide your company's particular job types to the list on the survey.

Account Executive (including sales)
Administrative Assistant
Bookkeeping & Accounting
Child Care Worker
Chiropractor
Counselor (Social Worker)
Customer Service Representative
Dental Assistant
Dental Hygienist
Dentist
Emergency Medical Technician
Human Service Case Manager
Interpreter
Management
Manager – General
Medical Records Technician
Nurse
Nursing Assistant
Nutritionist
Occupational or Physical Therapist
Occupational or Physical Therapist Assistant
Optometrist
Personal and Home Care Aide
Personnel Staff
Personnel Supervisor
Pharmacist
Physician
Physician's Assistant
Psychiatric Aides & Technicians
Psychologist

The following is a list of suggested job types to assist you in completing the enclosed Employment Survey. Please provide your company's particular job types to the list on the survey.

Account Executive
Administrative Assistant
Architects, Planners
Bookkeeping & Accounting
Brokers
Building and Maintenance Staff
Commercial Artist
Computer Programmer
Customer Service Representative
Data Entry
Data Warehouse Developer
Database Analyst
Desktop Publisher
Drivers
Engineer
Financial Analyst
Graphic Designer
Hardware Technician
Management
Management Analyst
Manager - General Office
Marketing Analyst
Network Technician
Packagers, Shipping & Receiving
Personnel Staff
Personnel Supervisor
Project Manager
Public Relations Specialist
Researcher
Software Technician
Statistical Analyst
Surveyors & Mapping Scientists
Technical Service Manager
Technical Writer
Telemarketer
Transportation Planners
Web Designer

APPENDIX C

84 AGGREGATE JOB TYPES

ACCOUNT EXECUTIVE
ACCOUNTANT
ACTIVITIES COORDINATOR
ADMINISTRATION
ADMINISTRATIVE ASSISTANT
ADMINISTRATIVE SUPPORT
ANALYST
ARCHITECT/PLANNER
ATTORNEY
BENEFITS
BILLING
BUSINESS DEVELOPMENT
CASE MANAGER
CLAIMS
CLERK
COMMUNICATIONS
COMPUTER TECHNICIAN
CONSULTANT
CONTROLLER
COUNSELOR
CUSTOMER SERVICE
DATA ANALYST
DATA MANAGEMENT
DENTAL
DESIGNER
DIETARY SERVICES
DRIVER
ENGINEER
EXECUTIVE MANAGEMENT
FACILITIES OPERATION
FINANCE
FINANCIAL ANALYST
FOOD SERVICES
GIS
GRAPHIC
HOUSKEEPING
HUMAN RESOURCES
MANAGEMENT
MANUFACTURER
MANUFACTURING
MARKET ANALYST
MARKETING
MEDICAL RECORDS TECHNICIAN
MEDICAL SERVICE ADMINISTRATION
MEDICAL SUPERVISOR
MEDICAL TECHNICIAN
NURSE
NURSE ASSISTANT
NURSE PRACTITIONER
NUTRITIONIST
OCCUPATIONAL THERAPIST
OPERATIONS
PERSONNEL
PHARMACIST
PHYSICAL THERAPIST
PHYSICIAN
PHYSICIAN ASSISTANT
PRESS
PRODUCTION
PROGRAMMER
PROJECT MANAGER
PSYCHOLOGIST
PUBLIC RELATIONS
PUBLISHING
PURCHASING
QUALITY ASSURANCE
RECEPTIONIST
RECRUITER
RESEARCH
RESEARCH - NON SCIENTIFIC
SALES
SCIENTIFIC LAB
SCIENTIST
SECURITY
SOCIAL WORKER
SOFTWARE ENGINEER
SPEECH PATHOLOGIST
STRIPPER
TECHNICAL WRITER
TECHNICIAN
TELEMARKETER
TELLER
TRAINING
WEB DESIGNER

APPENDIX D

TABLE 1: SKILL DISTRIBUTION FOR JOB TYPES IN IT CLUSTER

IT CLUSTER* JOB TYPE	ADMINISTRATIVE	CRITICAL THINKING	COMPUTER PROGRAMMING	CUSTOMER SERVICE	DATA ANALYSIS	FINANCIAL/ ACCOUNTING	GRAPHIC DESIGN	INDUSTRY SPECIFIC KNOWLEDGE	MANAGEMENT	MARKETING/SALES	MATH	SCIENTIFIC LAB	SPREADSHEET ANALYSIS	VERBAL COMMUNICATIONS	WORD PROCESSING	WRITING	TECHNICAL INDEX
WEB DESIGNER		32.7	33.6				1.0	22.9	3.3					6.5			34.6
SOFTWARE ENGINEER		28.7	42.5		0.5		0.9	26.4	0.5		0.5						44.4
ACCOUNT EXECUTIVE	8.3	4.8		27.4					4.2	1.2				20.8	1.2	32.1	0.0
TECHNICIAN	3.1	18.4	17.3	14.3		2.0		30.6	2.0	3.1			2.0	6.1		1.0	19.3
ADMINISTRATIVE ASSISTANT	8.1	24.2		4.8		2.4		0.8					25.8	4.8	29.0		25.8
ACCOUNTANT	5.6	27.8				35.2		27.8	0.9		2.8						2.8
CONSULTANT		**1.3**	**31.6**				**31.6**	**1.3**	**32.9**					**1.3**			**63.2**
PROJECT MANAGER	27.3	6.5	2.6	26.0				5.2	5.2					27.3			2.6
SALES		11.7		25.0				13.3		21.7			8.3	20.0			8.3
EXECUTIVE MANAGEMENT	8.5	25.4				8.5		3.4	25.4	1.7				3.4	6.8	16.9	0.0
SCIENTIST		**22.2**	**1.8**		**31.5**			**22.2**	**1.9**		**11.1**	**9.3**					**53.7**
PROGRAMMER		33.3	33.3					33.3									33.3
ENGINEER		**14.6**	**33.3**	**10.4**	**8.3**		**8.3**	**25.0**									**50.0**
MANAGEMENT	11.4	22.7		2.3				13.6	22.7	9.1				15.9		2.3	0.0
ADMINISTRATION	12.2	22.0		2.4		4.9			26.8	2.4			2.4	4.9		22.0	2.4
MARKET ANALYST		15.0			5.0	5.0		10.0	10.0	30.0			5.0	15.0		5.0	10.0
CUSTOMER SERVICE	2.8	8.3	2.7	36.1	11.1			25.0						13.9			13.8
PRODUCTION	12.9	6.5		12.9			3.2	19.4	9.7	3.2	6.5			16.1	6.5	3.2	9.7
TECHNICAL WRITER		14.3					19.0	28.6		4.8						33.3	19.0
QUALITY ASSURANCE		37.5	31.3					31.3									31.3
GRAPHIC		**30.0**	**10.0**				**40.0**	**10.0**	**10.0**								**50.0**
MARKETING		11.1							22.2	11.1			11.1	22.2		22.2	11.1
DATA ANALYST		**33.3**	**11.1**		**11.1**						**44.4**						**66.7**
TELEMARKETER				40.0				20.0		20.0				20.0			0.0
PERSONNEL	50.0	50.0															0.0
PUBLISHING		33.3						33.3								33.3	0.0
FINANCE					**33.3**	**33.3**							**33.3**				**66.7**
CONTROLLER		33.3							33.3	33.3							0.0
HUMAN RESOURCES			33.3					33.3						33.3			33.3
TRAINING		33.3						33.3						33.3			0.0
DATA MANAGEMENT	33.3			33.3											33.3		0.0
RECEPTIONIST				100.0													0.0
CLUSTER TOTALS	4.5%	20.9%	16.2%	7.5%	1.7%	3.1%	2.5%	16.4%	5.7%	2.4%	0.9%	0.3%	2.5%	7.7%	2.6%	5.1%	24.2%

*Data expressed in percent of total skills reported for job type. Yellow columns indicate a technical skill. Bolded job types indicate a technical index over 50%.

TABLE 2: SKILL DISTRIBUTION FOR JOB TYPES IN SCIENCE CLUSTER

SCIENCE CLUSTER JOB TYPE	ADMINISTRATIVE	COMPUTER PROGRAMMING	CRITICAL THINKING	CUSTOMER SERVICE	DATA ANALYSIS	FINANCIAL/ ACCOUNTING	GRAPHIC DESIGN	INDUSTRY SPECIFIC KNOWLEDGE	MANAGEMENT	MARKETING/SALES	MATH	SCIENTIFIC LAB	SPREADSHEET ANALYSIS	VERBAL COMMUNICATIONS	WORD PROCESSING	WRITING	TECHNCIAL INDEX
ENGINEER		**29.1**	**4.21**		**32.8**		**0.3**	**32.8**			**0.5**	**0.2**					**63.0**
RESEARCH	**0.2**	**30.5**			**27.0**		**2.9**	**5.5**			**5.1**	**25.6**	**2.2**	**0.8**		**0.2**	**93.3**
ADMINISTRATIVE ASSISTANT	33.0	0.2		4.1		1.4								29.2	29.2	2.9	0.2
DATA ANALYST		**32.9**	**0.47**		**33.3**			**32.9**			**0.5**						**66.7**
SCIENTIST	**0.6**	**30.4**	**2.87**		**20.1**			**27.8**	**0.3**		**2.6**	**15.5**					**68.5**
PROJECT TECHNICIAN		4.1		3.3				43.8				43.8		4.1		0.8	47.9
MANUFACTURER		**27.8**						**36.1**			**36.1**						**63.9**
QUALITY ASSURANCE		**19.6**			**20.7**			**1.1**	**4.3**		**8.7**	**13.0**	**13.0**			**19.6**	**75.0**
EXECUTIVE MANAGEMENT	5.7	18.6			11.4			17.1	20.0	12.9		1.4	2.9	4.3		5.7	34.3
PROGRAMMER			33.33		33.3									33.3			33.3
TECHNICIAN		6.0	10.26	2.6	6.8	6.8		29.9	6.8			27.4		3.4			40.2
ADMINISTRATION	28.8			15.4		1.9		1.9	5.8			3.8		26.9	13.5	1.9	3.8
SCIENTIFIC LAB	**3.9**	**7.8**		**5.9**	**3.9**			**9.8**	**21.6**			**43.1**			**3.9**		**54.9**
RESEARCH - NON SCIENTIFIC									**33.3**			**33.3**	**33.3**				**66.7**
ACCOUNTANT	**6.7**	**15.6**			**2.2**	**33.3**		**2.2**		**2.2**	**8.9**		**28.9**				**55.6**
SOFTWARE ENGINEER		**28.2**	**33.33**		**5.1**		**25.6**	**5.1**			**2.6**						**61.5**
RECEPTIONIST	31.6			36.8										31.6			0.0
FINANCE	**5.3**				**2.6**	**34.2**			**2.6**		**26.3**		**28.9**				**57.9**
MANAGEMENT	13.5	13.5		10.8	8.1				24.3					18.9	8.1	2.7	21.6
PRODUCTION	33.3			33.3										33.3			0.0
PERSONNEL	4.8	4.8		42.9										42.9	4.8		4.8
CLERK				33.3		33.3							33.3				33.3
CONSULTANT		11.1		11.1	33.3									44.4			44.4
BILLING				33.3		33.3							33.3				33.3
HUMAN RESOURCES				33.3					33.3					33.3			0.0
SALES								33.3		33.3				33.3			0.0
PURCHASING				33.3		33.3							33.3				33.3
FINANCIAL ANALYST									**50.0**				**50.0**				**50.0**
FACILITIES OPERATION		**100.0**															**100.0**
ACCOUNT EXECUTIVE				**50.0**	**50.0**												**50.0**
ATTORNEY		**33.3**						**33.3**				**16.7**				**16.7**	**50.0**
ADMINISTRATIVE SUPPORT				33.3													0.0
CONTROLLER	33.3					33.3								33.3	33.3		33.3
MARKETING				33.3		33.3				33.3			33.3				0.0
SECURITY								50.0	50.0								0.0
COMMUNICATIONS																	0.0
CLUSTER TOTALS	4.4%	22.2%	2.8%	2.2%	20.6%	1.4%	0.7%	21.6%	1.7%	0.4%	3.5%	7.4%	1.9%	5.3%	3.1%	0.9%	56.3%

*Data expressed in percent of total skills reported for job type. Yellow columns indicate a technical skill. Bolded job types indicate a technical index over 50%.

TABLE 3: SKILL DISTRITBUTION FOR JOB TYPES IN HEALTH CLUSTER

HEALTH CLUSTER JOB TYPE*	AMINISTRATIVE	CRITICAL THINKING	COMPUTER PROGRAMMING	CUSTOMER SERVICE	DATA ANALYSIS	FINANCE/ ACCOUNTING	GRAPHIC	INDUSTRY SPECIFIC KNOWLEDGE	MANAGEMENT	MARKETING	MATH	SCIENTIFIC LAB SKILLS	SPREADSHEET ANALYSIS	VERBAL COMMUNICATION	WORD PROCESSING	WRITING	TECHNICAL INDEX
NURSE		31.4		31.0	1.9			23.3	1.4			0.1		8.9			2.0
NURSE ASSISTANT		28.4		21.1	14.1			0.6						35.8			14.1
MANAGEMENT	4.9	27.8		11.0	0.6	0.6		21.4	19.0					14.7			0.6
PHYSICIAN		24.5		30.3				24.8				10.7		9.8			10.7
MEDICAL TECHNICIAN	22.1	17.3		19.2				24.0			6.6	1.5		9.2			8.1
ADMINISTRATION	3.4	32.1		0.8		0.4		27.5	27.5		5.7			2.7			5.7
PHYSICAL THERAPIST	12.2	33.3		19.0				15.6						19.7			0.0
ADMINISTRATIVE ASSISTANT	16.4	14.5		21.8		0.9		1.8	0.9					25.5	11.8	6.4	0.0
DIETARY SERVICES	1.2	18.5		22.2	14.8			3.7						38.3			14.8
OCCUPATIONAL THERAPIST		33.3		25.3				8.1						33.3			0.0
CASE MANAGER		33.3		33.3										33.3			0.0
COUNSELOR		29.1		22.1				11.6					1.2	34.9		1.2	1.2
TECHNICIAN		21.1	15.79	13.2	6.6			22.4	1.3		2.6			10.5	6.6		9.2
CUSTOMER SERVICE	22.4			16.4		7.5					7.5			46.3			7.5
HOUSKEEPING		12.7		25.4	12.7						2.8			40.8			15.5
PSYCHOLOGIST		33.3			31.7			31.7	1.7					1.7			31.7
BILLING	6.1	10.2		6.1	26.5	10.2		16.3			12.2			4.1	8.2		38.8
MEDICAL SUPERVISOR	4.2	33.3						33.3			29.2						29.2
SOCIAL WORKER		33.3		33.3	20.8									12.5			20.8
FINANCE	15.6	15.6			11.1	33.3					22.2		2.2				35.6
PHARMACIST								**37.2**			**37.2**	**16.3**		**9.3**			**53.5**
MEDICAL SERVICE ADMIN.	23.8	9.5		23.8										33.3	9.5		0.0
ACCOUNTANT	2.4	19.5			12.2	31.7		2.4	2.4		29.3						41.5
MEDICAL RECORDS TECHICIAN	2.9	28.6		11.4	17.1		2.9	17.1						2.9	17.1		20.0
TRAINING	12.1	15.2		6.1				27.3		6.1				33.3			0.0
CLERK	3.3	13.3		13.3		13.3		6.7			20.0			23.3	6.7		20.0
PHYSICIAN ASSISTANT		31.0		24.1				31.0				3.4		10.3			3.4
NUTRITIONIST		21.4		14.3	7.1			14.3			14.3			28.6			21.4
PERSONNEL		25.0		33.3	8.3	4.2		4.2	4.2					16.7	4.2		8.3
NURSE PRACTITIONER		13.0		26.1				39.1	13.0			4.3		4.3			4.3
SCIENTIFIC LAB		26.1						21.7			26.1	8.7		17.4			34.8
BUSINESS DEVELOPMENT	28.6	14.3			19.0	14.3		4.8	14.3					4.8			19.0
FOOD SERVICES				36.8				15.8			10.5			36.8			10.5
HUMAN RESOURCES	33.3							22.2			11.1			33.3			11.1
MARKETING	33.3									33.3				33.3			0.0
RECEPTIONIST	17.6			23.5											41.2	17.6	0.0
DATA ANALYST		**33.3**			**33.3**						**26.7**		**6.7**				**66.7**
PUBLIC RELATIONS	26.7	6.7		26.7				6.7						33.3			0.0
DENTAL				33.3				33.3						33.3			0.0
FINANCIAL ANALYST	33.3	33.3			33.3												33.3
ACTIVITIES COORDINATOR				15.4										38.5	23.1		0.0
ANALYST			33.33					33.3	33.3								0.0
BENEFITS	33.3			33.3											33.3		0.0
CLAIMS				33.3							33.3			33.3			33.3
CONTROLLER		16.7			16.7	33.3			33.3								16.7
QUALITY ASSURANCE		33.3			33.3			33.3									33.3
SECURTIY		33.3									33.3			33.3			33.3
SPEECH PATHOLOGIST		33.3						33.3						33.3			0.0
TECHNICAL WRITER	33.3													33.3	33.3		0.0
TELEMARKETER				33.3						33.3				33.3			0.0
OPERATIONS				100.0													0.0
DATA MANAGEMENT	33.3										33.3				33.3		33.3
EXECUTIVE MANAGEMENT	33.3								33.3		33.3						33.3
CONSULTANT								33.3	33.3								0.0
FACILITIES OPERATION				33.3				33.3									0.0
PURCHASING		50.0						50.0									0.0
CLUSTER TOTALS	**4.1%**	**26.2%**	**0.3%**	**21.8%**	**4.3%**	**1.0%**	**0.0%**	**17.3%**	**3.5%**	**0.2%**	**2.6%**	**1.0%**	**0.1%**	**16.3%**	**1.0%**	**0.2%**	**8.3%**

*Data expressed in percent of total skills reported for job type. Yellow columns indicate a technical skill. Bolded job types indicate a technical index over 50%.

TABLE 4: SKILL DISTRIBUTION FOR JOB TYPES IN BUSINESS FINANCE CLUSTER

BUSINESS & FINANCE JOB TYPE*	AMINISTRATIVE	COMPUTER PROGRAMMING	CRITICAL THINKING	CUSTOMER SERVICE	DATA ANALYSIS	FINANCE/ ACCOUNTING	GRAPHIC	INDUSTRY SPECIFIC KNOWLEDGE	MANAGEMENT	MARKETING	MATH	SCIENTIFIC LAB SKILLS	SPREADSHEET ANALYSIS	VERBAL COMMUNICATION	WORD PROCESSING	WRITING	DRAFTING	DRAWING	TECHNICAL INDEX
ARCHITECT/PLANNER	2.2	0.17	27.0		6.8	0.2	7.3	27.0	18.6	0.2	4.6			1.7	0.3	0.2	0.3	3.4	22.5
ENGINEER		0.97	33.7	5.8	4.2		4.9	35.9	4.2		6.1	1.0		3.2					16.2
MANAGEMENT	3.8	0.54	4.9	5.9		1.1	0.5	30.3	38.9	2.2	0.5			10.3	0.5	0.5			1.1
ADMINISTRATIVE ASSISTANT	32.7		4.2	2.4	0.6	1.2			0.6	0.6			1.2	18.5	26.8	10.1			1.8
PROJECT MANAGER	1.3		5.3	26.0	6.7			26.7	4.0	0.7				26.0		3.3			6.7
ACCOUNTANT	15.5		3.9		7.8	32.0	4.9	7.8	2.9		13.6		7.8	2.9	1.0				34.0
BANK TELLER				33.3				29.1			4.3			33.3					4.3
EXECUTIVE MANAGEMENT	3.2		16.8		5.3	7.4		23.2	26.3	7.4			2.1	6.3		1.1	1.1		8.4
GRAPHIC	5.1		20.3	5.1			32.9	19.0	1.3					10.1		6.3			32.9
CONSULTANT		6.41	25.6		15.4	1.3		17.9	14.1	5.1			6.4	5.1	2.6				21.8
ADMINISTRATION	25.3		6.7	2.7	5.3	8.0		5.3	1.3		5.3		13.3	16.0	6.7	4.0			24.0
TECHNICIAN	15.2	27.27	7.6	7.6	6.1			7.6	4.5		3.0		3.0		12.1				12.1
ANALYST			**11.5**		**44.2**				**3.8**		**7.7**		**32.7**						**84.6**
RESEARCH	10.4	2.08	4.2		22.9			14.6			2.1		10.4	12.5	8.3	12.5			35.4
PRODUCTION	32.6		7.0	25.6			14.0	9.3	2.3					9.3					14.0
MARKETING	17.5		2.5	2.5				2.5	7.5	30.0				17.5		20.0			0.0
CLERK	10.3			25.6				28.2						35.9					0.0
PROGRAMMER		**33.33**	**19.4**		**19.4**		**13.9**	**13.9**											33.3
SCIENTIST			**30.3**		**30.3**			**3.0**	**3.0**			**3.0**		18.2		12.1			33.3
ADMINISTRATIVE SUPPORT	43.3			16.7										40.0					0.0
CUSTOMER SERVICE				33.3				25.0	8.3					33.3					0.0
SOFTWARE ENGINEER		**75.00**					**12.5**				**12.5**								25.0
DESIGNER					25.8		9.7	32.3	3.2								3.2		38.7
FINANCE				28.6		4.8		28.6	4.8				4.8	28.6					4.8
SALES			14.3	4.8				19.0	14.3	19.0				23.8		4.8			0.0
PERSONNEL			5.6	33.3				11.1						44.4		5.6			0.0
MARKET ANALYST			6.7		6.7				6.7	26.7				53.3					6.7
RECRUITER				26.7				6.7	26.7	6.7				33.3					0.0
RECEPTIONIST	71.4												7.1	14.3	7.1				7.1
ACCOUNT EXECUTIVE			33.3	33.3										33.3					0.0
PUBLISHING	8.3	8.33					16.7	8.3	8.3		16.7			16.7		16.7			33.3
PUBLIC RELATIONS			9.1	27.3					9.1					36.4		18.2			0.0
MANUFACTURING			**50.0**								**50.0**								**50.0**
HUMAN RESOURCES	22.2								22.2					33.3		22.2			0.0
CONTROLLER						33.3			33.3				16.7	16.7					16.7
PRESS								33.3			33.3			33.3					33.3
GIS		**40.00**			**60.0**														**60.0**
FACILITIES OPERATION														100.0					0.0
BUSINESS DEVELOPMENT				33.3						33.3				33.3					0.0
DATA MANAGEMENT	33.3			33.3											33.3				0.0
PUBLISHING STRIPPER								33.3			33.3			33.3					33.3
TECHNICAL WRITER			50.0													50.0			0.0
WEB DESIGNER		**50.00**					**50.0**												**50.0**
DRIVER														100.0					0.0
TRAINING	100.0																		0.0
CLUSTER TOTALS	**7.2%**	**2.4%**	**15.3%**	**7.1%**	**6.2%**	**2.1%**	**4.2%**	**20.4%**	**10.4%**	**1.5%**	**3.5%**	**0.2%**	**2.1%**	**11.4%**	**2.7%**	**2.3%**	**0.2%**	**0.8%**	**19.5%**

*Data expressed in percent of total skills reported for job type. Yellow columns indicate a technical skill. Bolded job types indicate a technical index over 50%.

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Committee Report #1

Committee Report from Councillor Henrietta Davis, Chair of the Economic Development, Training and Employment Committee, for a meeting held on November 27, 2001 to discuss a working plan for the distribution of a final report entitled "Education and Skill for the New Economy: A Survey of Employment Trends in Cambridge, Massachusetts." (A copy of the final report is attached)

In City Council December 17, 2001

Report Accepted, Placed on File on motion of Councillor Davis.