What Could Your Next Job Be?

Findings From the 1998 Minnesota Survey
of New and Evolving Occupations

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Executive Summary

Self-directed, team-oriented, problem solvers.

What is a new and evolving occupation or NEO? Simply put, NEOs are jobs that are on the cutting edge of occupational change in our state. By definition, these occupations are completely **new** to our economy or are continuously **evolving**. Webmasters, quality engineers and marketing coordinators are just some of the jobs riding the wave of a changing workplace driven by new technologies, customer needs, new regulations, reorganization and heightened competition.

Highlights from the 1998 New and Evolving Occupation survey include:

- Workers in NEOs need to be self-directed, team-oriented workers who readily solve vexing company problems, meet challenges head-on, and apply core reading, math, and science skills to identify, process, and analyze information and data every day.
- While most NEOs require some degree of formal education or training (the average level of education for these positions is an associate's degree), a formal degree or training just isn't enough. Employers need workers who possess a wide variety of skills and abilities and can continuously build on their knowledge base by remaining active, life-long learners.
- Out of the several occupational clusters identified in this report, the high tech cluster has the most NEO job titles, the highest employment, and the most new hires in 1998. Employers with high tech positions report the most vacancies and indicated that finding qualified applicants to fill these positions has been difficult.
- Overall, firms with NEOs are most likely to be found in seven specific industries: government; durable manufacturing; printing; business services; health services; general services; and wholesale trade. In addition, new or evolving occupations are more likely to be found in firms with more than 75 employees and can be found across Minnesota.
- Results indicate that almost one-third of workers in new and evolving occupations were hired as recently as 1998. One-quarter of employers reported that the position was currently vacant. Salaries for full-time workers in NEOs range from $14,600 to $115,000, and vary greatly by occupational group, employer, experience and position.

About the 1998 New and Evolving Occupations Survey

In order to find new and evolving occupations in Minnesota, the Minnesota Department of Economic Security mailed a survey to 5,700 employers across the state. In the survey, employers were asked to identify occupations within their firm that fit the following definitions:

- **New occupations** are those where skill sets (knowledge, skills, abilities and work activities) are so new they are not captured by present occupational classifications.
- **Evolving occupations** are established occupations that have seen a rapid change in their skill sets in recent years and, as a result, require updated information.

The 965 firms (16.9 percent) that responded to the survey submitted 492 job titles. Only 315 of these titles (179 firms) satisfy the definition of a NEO as listed above. Analysts categorized these 315 titles and grouped them, according to their job duties or industry, into six larger occupational clusters (high tech, industrial safety, management and administration, quality control, health service, and printing and publishing).

Introduction

What could your next job be?

Does your list of potential careers to explore include the following occupations: principal applications analyst, webmaster, curriculum integration specialist, safety director, quality engineer, desktop publisher or restorative justice specialist? It should. Do you currently possess the skills, knowledge, and abilities needed to perform these jobs and meet necessary job requirements? You might. These and other prospective jobs along with their essential skills were recently identified through a survey of Minnesota employers that sought to define occupational and skill trends in the workplace.

In Minnesota's dynamic economy, where occupations appear and evolve rapidly, distinguishing these new and evolving occupations, or NEOs, is important. It provides a glimpse of changing workplace demands and the up-to-date skill and educational requirements required by successful job seekers to take part in today's workforce. This report, when combined with other employment trend information, is an ideal tool for job seekers, students and career-changers making long-term career plans. In particular, this report presents detailed information about NEOs, including:

- The distribution of these jobs across industries, firms and regions;
- The underlying factors that contributed to the creation or evolution of these jobs;
- The ease with which employers can find qualified applicants to fill vacant positions;
- The minimum level of education or training required for each job;
- The wages, hours, employment, new hires and reported vacancies for each job;
- A comparison of the importance of specific work activities, skills, abilities, and knowledge to job performance for NEOs and all other occupations in Minnesota.

Comparison with Previous Studies

Efforts at identifying NEOs and the skills they require are rather new and varied. To date, the U.S. Department of Labor Bureau of Labor Statistics (BLS) and state agencies in Minnesota, California and Texas have taken significant efforts to analyze new and evolving occupations.

The Texas State Occupational Information Coordinating Committee (1996 and 1998) utilized industry payroll titles and labor market information to identify occupations prior to surveying employers for skills and wage information. In particular, researchers identified high growth, high wage, capital-intensive, technical and professional oriented occupations that had educational requirements ranging from six months to an associate's degree. The California Employment Development Department (1995) conducted telephone interviews and focus groups with employers who advertised in California newspapers to identify occupations created through technological innovation, skill modification, or as an offshoot of an existing occupation.

While the studies listed above are informative, this report builds instead on previous work done in Minnesota and ongoing efforts at the Bureau of Labor Statistics. Following the BLS model, which is based on data collected through the Occupational Employment Statistics (OES) program, researchers examined job titles and descriptions submitted by employers to determine which job titles represent new or evolving occupations. Similar to the New and Emerging Occupations (1997) project conducted by the Minnesota Department of Economic Security (MDES) Research and Statistics Office, this study surveyed employers and asked them provide information on wages, hours worked, employment and hiring, and the factors that contribute to changes in the workplace. A number of unique questions were added which focus on the importance of the specific abilities, skills, activities and knowledge based on performance requirements developed by the Occupational Information Network or O*NET. See Appendices A and B for information on the methodology and the skill language used in this study.

Chapter One
An Overview of New and Evolving Occupations (NEOs)

New Occupations: *Job titles where the sets of skills (knowledge, skills, abilities and work activities) needed to perform the job are so new they are not captured by present occupational classifications.*

Evolving Occupations: *Established occupations that have seen a rapid change in their skill sets in recent years and, as a result, require updated information.*

Information on NEOs comes from a survey of Minnesota employers. The survey asked employers to identify jobs in the firm that matched the definition of a new or evolving occupation. The survey also provided a list of occupations previously identified as NEOs through a survey conducted by the Minnesota Department of Economic Security (MDES) Research and Statistics Office in 1997. In addition, employers were asked to provide detailed information on skills, wages, and employment for three job titles that best captured the changing skill requirements in their company over the past five years. Firms without new or evolving occupations were also encouraged to respond.

NEOs by Industry, Size and Location

Because employers without new or evolving occupations also responded to the survey, the 965 firms (16.9 percent) that did reply permit some provisional observations about the projected distribution of these occupations across industries, firm sizes and locations. See Appendices A and D for more on methodology and the distribution of NEOs by industry, size and location.

Out of fourteen industrial sectors, firms with NEOs are most likely to be found in seven specific industries: government; durable manufacturing; printing; business services; health services; general services; and wholesale trade (see Figure 1). They are less prevalent in firms in agriculture; construction; finance, insurance and real estate (FIRE); non durable manufacturing; mining; retail trade; and transportation, communication and public utilities (TCPU). The development of NEOs in particular industries in Minnesota reflects occupational trends at the national level. In particular, the U.S. Department of Labor Federal Bureau of Labor Statistics (BLS) identified the service and manufacturing sectors as producing a large share of NEOs nationally.

Figure 1: Projected NEO Distribution by Industry

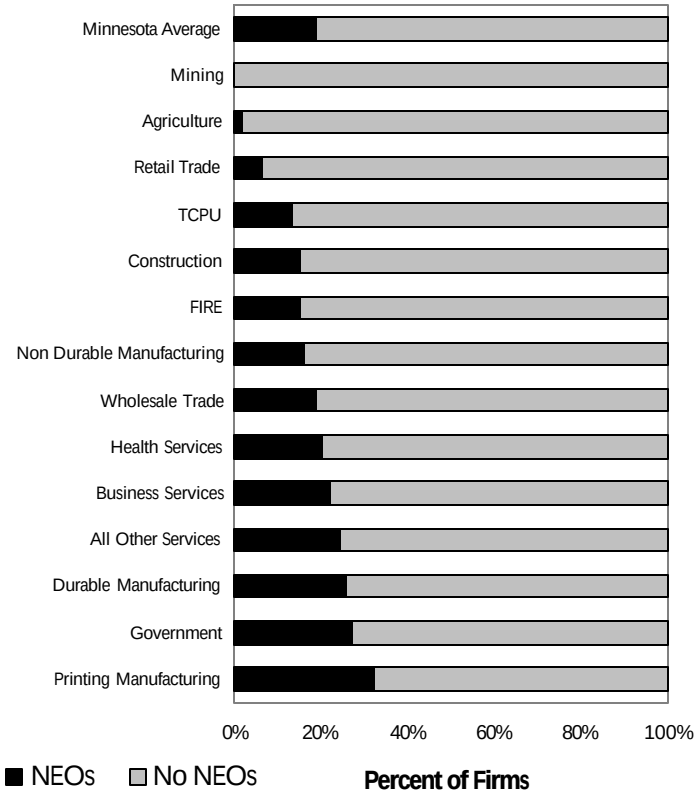
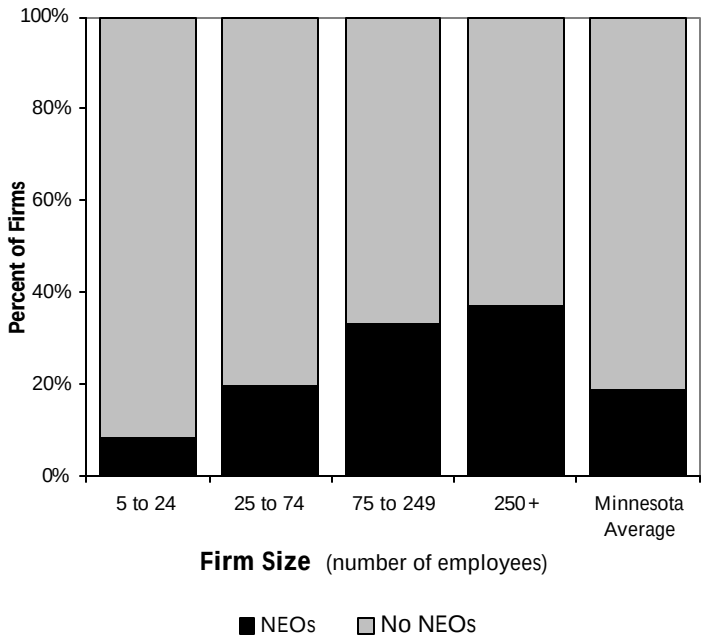


Figure 2: Projected NEO Distribution by Firm Size



New or evolving occupations are more likely to be found in firms with 75 or more employees (see Figure 2). Proportionally, firms with less than 75 employees had fewer NEOs. Firms with or without new and evolving occupations were evenly distributed across Greater Minnesota, St. Paul and Minneapolis and the state's four metropolitan statistical areas (Twin Cities (excluding Minneapolis and St. Paul), St. Cloud, Duluth, and Rochester).

Occupational Clusters

Of the 965 firms that responded to the survey, 347 identified 492 job titles as new or evolving occupations. However, not all of these jobs met study criteria. Following a review, 315 titles from 179 firms (18.5 percent of respondents) were found to satisfy the definition of a NEO as defined above (see Appendix B for more information on how these occupations were identified and Appendix F for titles). In turn, these NEO job titles were grouped into six occupational clusters: high tech, industrial safety, management and administration, quality control, health service, and printing and publishing. Table 1 provides an overview of these six clusters and detailed education and skill information for each cluster can be found in Chapter 2.

Table 1: NEO Clusters by Employment

	Titles	Employment	New Hire in 1998
Health Service	11	46	12
High Tech	189	836	270
Industrial Safety	31	113	16
Management and Administration	26	34	21
Printing and Publishing	31	353	83
Quality Control	27	72	22
Total	**315**	**1454**	**424**

	Salary Ranges*	Finding Qualified Applicants
Health Service	$25,000-51,800	Average
High Tech	$17,700-114,400	Difficult
Industrial Safety	$20,800-72,500	Average
Management and Administration	$21,800-115,000	Average
Printing and Publishing	$14,600-49,100	Difficult
Quality Control	$16,600-69,500	Average

*Full-time Employees

Health Service

The health service cluster contains a number of new and evolving occupations including resident assessment coordinator, adult nurse practitioner, and health quality assurance coordinator. Driven by changing legal requirements, customer needs, increased competition, and workplace reorganization, workers in this cluster are involved in direct service to clients or specialize in the coordination or

management of health services. According to employers who responded to the survey, one-quarter of all workers in health service NEOs were hired in 1998 and their salaries ranged from $25,000 to $51,800 annually.

High Tech

This cluster is defined by occupations that use, develop, coordinate or manage technological tools, information, and systems. High tech represents the largest of the six occupational clusters in terms of job titles, employment, new hires and occupations with skill data.

Occupations in this cluster are found in 13 out of 14 industrial sectors. The most frequently reported occupations in this cluster are personal computer specialists/technicians (36 percent), followed by network administrators (10 percent) and management information systems specialists (10 percent). According to employers, technological advances are an extremely important factor driving occupational changes, while customer needs, increased competition, and changes in the workplace are also considered very important (see Table 2).

Table 2: Factors Contributing to Occupational Change

	Technological Advances	Legal Requirements	Customer Needs	Increased Competition	Changes in Workplace Organization
Health Services	Important	Very Important	Very Important	Very Important	Very Important
High Tech	Extremely Important	Somewhat Important	Very Important	Very Important	Very Important
Industrial Safety	Important	Very Important	Important	Important	Very Important
Management and Administration	Important	Somewhat Important	Very Important	Important	Very Important
Printing and Publishing	Very Important	Not Important	Extremely Important	Very Important	Important
Quality Control	Important	Important	Very Important	Very Important	Very Important

Employers who responded to the survey reported that almost one-third of all workers in the high tech cluster were hired in 1998. While the salary range for high tech occupations is large and varies by education and training level, task, employer, and level of employment, 75 percent of workers in this occupational category earn more than $30,000 annually. On average, employers with occupations in this cluster responded that it is difficult to find qualified applicants to fill positions. This finding supports a previous MDES study (1998) which found that employers had problems finding qualified information technology workers. (Employment projections for the period 1996 to 2006 suggest that the growth of information technology jobs will remain robust well into the next century.)

Industrial Safety

The workers in this cluster monitor workplace conditions to ensure employee health, comfort and workplace efficiency. Industrial safety NEOs are found in nine out of 14 sectors, especially in manufacturing, construction and government. Overall, employers report an average degree of difficulty in finding qualified applicants and indicate that new legal requirements and workplace changes are quite important with regard to creation or evolution of jobs in this cluster (see Table 2). Only 10 percent of workers in this cluster were hired in 1998 and the most frequently reported job title was safety director or manager. Salaries for this cluster range from $20,800 to $72,500 for full-time workers.

Management and Administration
Workers in this occupational cluster manage other workers, lead or coordinate projects, or specialize in functions vital to a firm. New and evolving occupations in this cluster are found in ten out of 14 industries, especially in service and trade sectors. Occupational change in these jobs is primarily driven by addressing customer needs and as a result of changes in the workplace. Employers report an average degree of difficulty in finding qualified workers. According to employers who responded to this survey, nearly two-thirds of the workers in this cluster were hired in 1998 and salaries for full-time workers range from $21,800 to $115,000.

Printing and Publishing
Workers in the printing and publishing cluster perform a variety of duties, from operating printing presses, planning and maintaining schedules for press operations, testing printing operations, and generating electronic print documents for production. Employers identified changing customer needs as an extremely important factor influencing the rapid change or creation of new jobs in this cluster. Competition and technological advances were also considered very important factors.

As with the high tech cluster, employers report having difficulty finding qualified workers to fill positions. According to employers who responded to the survey, nearly one-quarter of printing and publishing workers were identified as new hires. Annual salaries for full-time workers in this cluster range from $14,600 to $49,100. In addition, one of the jobs in this cluster, desktop publishing specialist, was ranked as one of Minnesota's Top 100 Occupations for projected employment growth.

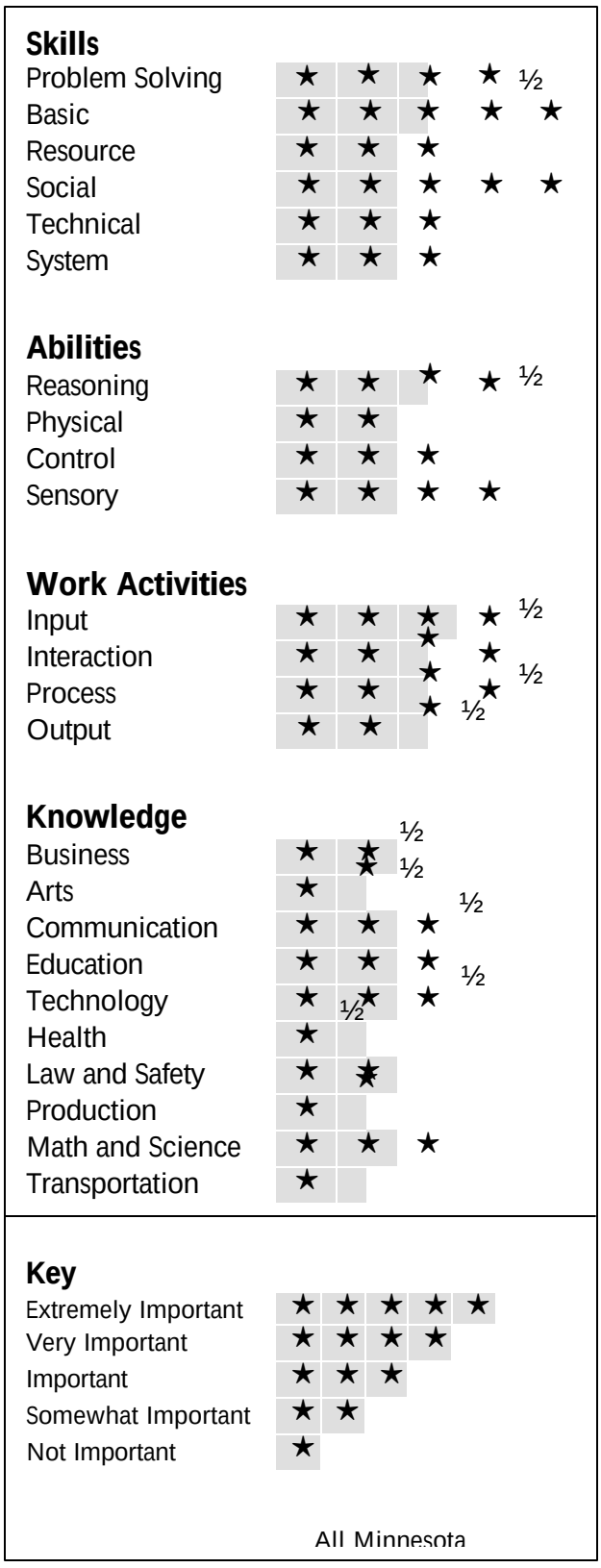
Quality Control
Employers rely on workers in quality control NEOs to develop, oversee and analyze quality control programs in their company. Specifically, quality analysts, auditors, managers, and coordinators regularly evaluate and test the quality of specific products, services, processes and systems within a firm. Over half of these quality control workers are employed in the manufacturing sector. Occupational change in this cluster is driven primarily by a combination of three factors, customer needs, increased competition and workplace reorganization. Almost one-third of quality control workers were recently hired and annual salaries for workers in this cluster range from $16,600 to $69,500 annually.

O*NET Dictionary

Skills	PROBLEM SOLVING	*The capacity to solve ill-defined problems in complex, real-world settings.*
	BASIC	*Completing tasks using basic skills, such as reading, math and science.*
	RESOURCE MANAGEMENT	*The efficient allocation of time, financial, material and/or human resources.*
	SOCIAL	*The ability and willingness to work with others to achieve goals.*
	TECHNICAL	*The ability to design, set-up, operate and repair machinery and technological applications.*
	SYSTEMS	*The ability to improve social arrangements and technical systems in the workplace.*
Abilities	REASONING	*The ability to acquire and apply knowledge in problem solving.*
	PHYSICAL	*Using strength, endurance, flexibility, balance and coordination to complete tasks.*
	CONTROL	*The ability to handle and control objects in the workplace.*
	SENSORY	*The ability to see, hear and talk to complete job tasks.*
Work Activities	INFORMATION INPUT	*Finding where and how to gain information and data to perform the job.*
	INTERACTING WITH OTHERS	*Interacting with other persons or supervising activities.*
	MENTAL PROCESSES	*Requires processing, planning, problem solving, and decision making.*
	WORK OUTPUT	*Requires performing physical activities, operating/controlling equipment, and performing complex/technical activities.*
Knowledge	BUSINESS AND MANAGEMENT	*Knowledge of principles and facts related to business administration and management, accounting, economics, sales and marketing.*
	ARTS AND HUMANITIES	*Knowledge of the branches of learning concerned with human thought, language and arts.*
	COMMUNICATION	*Knowledge of the science and art of delivering information.*
	EDUCATION AND TRAINING	*Knowledge of instructional methods, teaching techniques, test design and individual development.*
	ENGINEERING AND TECHNOLOGY	*Job requires knowledge of the design, development and application of technology for specific purposes.*
	HEALTH SERVICES	*Knowledge of diagnosing, curing, and preventing disease, and improving physical and mental health.*
	LAW AND PUBLIC SAFETY	*Knowledge of keeping people and property free from danger, harm or injury.*
	MANUFACTURING AND PRODUCTION	*Knowledge of principles and facts related to the production, processing, storage, and distribution of manufactured and agricultural goods.*
	MATH AND SCIENCE	*Knowledge of the principles and facts related to mathematical, physical, biological and social sciences.*
	TRANSPORTATION	*Knowledge of the methods for moving people or goods by air, sea or road, including their relative costs, advantages and limitations.*

Chapter Two

Education and Skill Requirements for New and Evolving Occupations



What skills will I need?

What skills will you need in these cutting edge jobs? For each job title submitted, employers were asked to rate how important specific skills, knowledge, activities and abilities are to job performance (definitions are provided on the previous page). Employers were also asked to identify the minimal educational, training or special preparation (e.g., license) required. Each category average is weighted by employment.

What skill set distinguishes a NEO? While almost all skills, abilities, activities and knowledge are important for new and evolving occupations, employers rate several as "very" or "extremely" important. Specifically, NEOs require workers with the capacity and willingness to work with others to achieve goals on a daily basis (**social skills** and **interaction activity**). Workers must also be able to use math, science and reading skills to complete job tasks (**basic skills**) and be able to allocate company resources effectively (**resource skills**).

Every day, workers in these occupations must be able to acquire and apply knowledge (**reasoning abilities**) to solve ill-defined problems in complex, real world settings

← How to read this table.

In the figure on this page, the gray shaded box denotes the average level of importance of a specific skill, ability, activity or knowledge for all Minnesota occupations. The star represents the level required by NEOs. For example, the average level of importance for social skills for all occupations in Minnesota is only somewhat important to job performance, while the same skill is rated as extremely important for NEOs.

(**problem solving skills**). They must also be able to figure out where and how to find the information and data they need (**input activity**) to do their job. Once found, they must be able to asses, evaluate and analyze the information or data and, in turn, process the data or information into a usable format (**process activity**). While employers rate the ability to see, hear and talk (**sensory abilities**) to complete job tasks as very important, the use of other physical abilities, such as strength, endurance and flexibility (**physical abilities**) rate as below average.

The minimal level of education or training required across all NEOs is an associate's degree. Only four knowledge categories (**communication**, **engineering and technology**, **math and science** and **education and training**) rate as important to job performance. Overall, the level of formal education and specific knowledge required varies by occupation.

Based on these skill, ability, and work activity contours, new and evolving occupations are distinguished from the average occupation in Minnesota by their high degree of self-direction, teamwork, problem resolution, and non-physical job specific tasks. What's more, NEOs are identified by their application of core reading, math, and science skills to identify, process, and analyze information from a wide variety of sources. Even though employers indicate that they still need adequately educated and trained workers to fill these positions, the lower scores given to knowledge categories seem to suggest that it may be more important for workers to be able to easily apply what they know in the workplace.

The following six sections expand on the findings discussed here by examining job performance information for each of the six occupational clusters. Each section also contains an in-depth occupational profile. Due to the significant number of high tech NEOs, two occupations are profiled from this cluster. Scores for individual occupations are located in Appendix G.

Health Service NEOs

Table 3: Health Service Cluster and Occupations

Occupational Subgroups	Employed	New Hires	Job Titles	Salary Range (full-time workers)
All Health Service	**46**	**12**	**11**	**$25,000-51,800**
Health Service Coordinators	23	9	9	$30,200-51,800
Health Service Managers/ Professionals	23	3	2	*

* Data not available.

The health service cluster is composed of new and evolving occupations that are specific to one industry. This cluster contains a number of new and evolving occupations that are categorized as either health service coordinators or managers and professionals. Some of the specific titles found in this cluster include resident assessment coordinator, adult nurse practitioner, and health information manager (see Table 4). Employers who responded to the survey report that one-quarter of all workers in the cluster were considered new hires.

The titles in this cluster reflect the trend toward multi-faceted job duties and away from specialized functions as more firms in this sector move toward the managed health care service delivery model. The titles submitted suggest that the traditional educational paths to a career in health service remain important, yet employers in this cluster need workers who can move beyond their training in the medical field to embrace a wide variety of health-related activities.

Table 4: Health Service Cluster Job Titles

Cluster/Job Title	Number of Titles	NEO Status
Health Service Coordinator	**9**	
Diabetes Education Coordinator	1	Evolving
QA Coordinator	1	Evolving
QA/QI Coordinator	1	Evolving
Resident Assessment Coordinator/ Manger	5	New
Restorative Coordinator	1	New
Health Service Manager/Professional	**2**	
Adult Nurse Practitioner	1	Evolving
Health Information Manager	1	Evolving

Education and Skill Requirements

Employers, on average, require applicants with a bachelor's degree to fill new or evolving health service positions. Overall, educational requirements for workers range from an associate's degree for a restorative coordinator to a professional degree for a resident assessment coordinator. Several of the new and evolving health service occupations, including resident assessment coordinator and adult nurse practitioner, also require a registered nursing (RN) license. To obtain a RN license, individuals must graduate from an approved nursing program and pass an exam.

As with all NEOs, employers rate the capacity and willingness to work with others (**social skills**) and the ability to complete tasks with **basic skills**, such as reading, math and science, as extremely

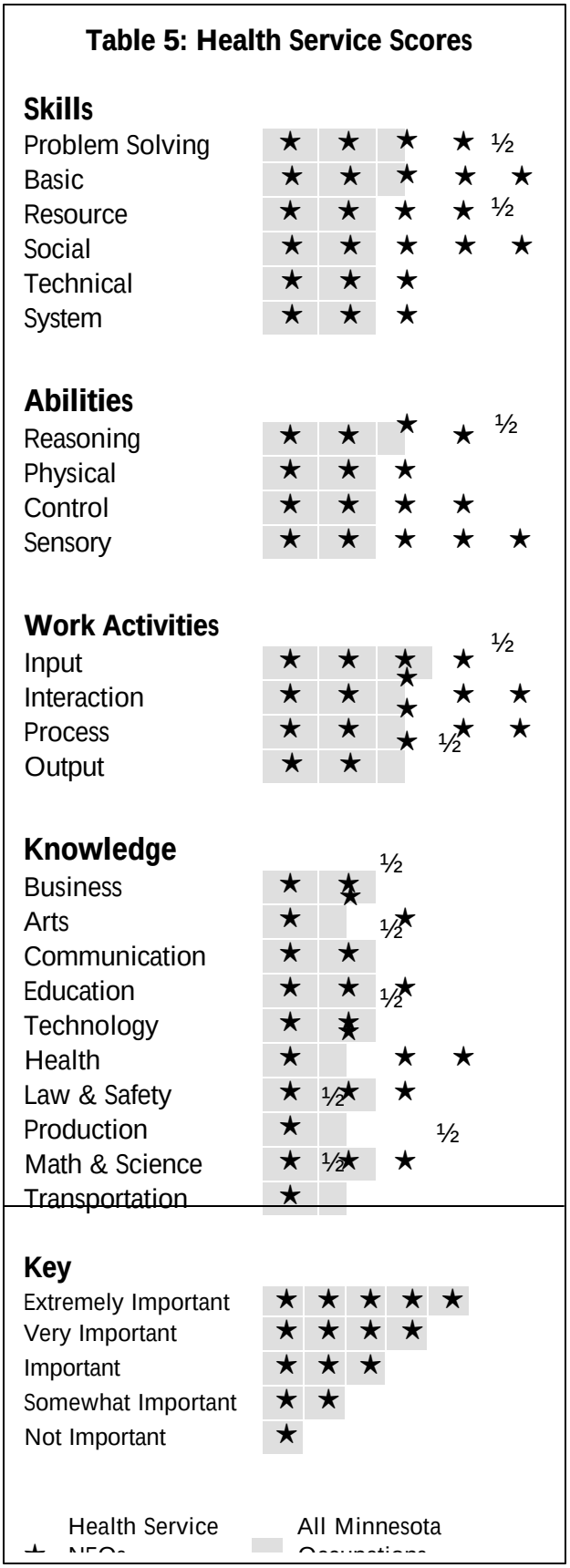
important. The abilities of workers to identify and overcome obstacles (**problem solving skills**) and manage firm resources (**resource skills**) are also considered very important. Given the number of workers in this cluster who either manage or coordinate health-related activities, the high rating given to **resource skills** is not surprising.

In addition to skills, employers were asked to gauge the importance of each of four abilities. Employers considered a combination of three abilities as very or extremely important, including **sensory**, **control** and **reasoning**. Having direct interactions with other employees and customers on the job (**interaction activity**) and being able to process, plan, problem-solve, and make decisions (**processes activity**) are considered critical to job performance for health service occupations.

While **health knowledge** is not important for new and evolving occupations in general, it is very important for health service occupations and reflects the education or training requirements for the majority of job titles. In addition, practical **math and science** knowledge is also considered to be very important to overall job performance.

One position in this cluster, diabetes education coordinator, best illustrates the move beyond occupational-specific tasks and the fusion of skill, ability, knowledge, and job activity. In addition to having completed a bachelor's degree in nursing and being licensed as a registered nurse, the person in this job is responsible for a wide variety of tasks, including diabetes program planning, implementation, coordination, and evaluation. He or she must also provide individual or group diabetes self-management education and related nursing interventions to inpatients, outpatients, and their families utilizing the nursing process and collaboration with an interdisciplinary team composed of health service professionals.

Table 5: Health Service Scores



Resident Assessment Manager

Reasoning Ability

Kristin Gaarder graduated with a bachelor's degree in nursing from Mankato State University and is a licensed registered nurse (RN). The Augustana Home in Minneapolis hired her as a floor nurse immediately following graduation. After one year with the firm, she was promoted to floor supervisor and managed the entire 359-bed facility on weekends. After working in this position for one year, she accepted a newly created position: resident assessment manager. Initially only a part-time position, it has evolved into a full-time management position during the last year.

Strong nursing skills and medical knowledge are still important for her current responsibilities. Gaarder's new responsibilities in this position, however, include coordinating, coding and following-up on patient assessments in order to meet state and federal guidelines for program cost reimbursements. In fact, the position itself grew out of recent governmental regulatory requirements, especially for Medicare and Medicaid, which required health care companies to report additional information on patients. Since regulatory changes made last October, for example, the number of assessments that need to be completed for each resident has grown from one per quarter to five.

Each assessment that Gaarder receives outlines the complete cognitive, mental and functional status of each resident. She and two other staff members read the charts and code assessment forms and, if there are mistakes on the charts, they evaluate the resident themselves. Based on their findings they may suggest changes in resident treatment. Due to the need to assess residents, each coordinator must be a registered nurse. Along with her nursing knowledge and skills Gaarder stresses the need for individuals in this position to be detailed orientated and computer savvy. Since deadlines are an important part of the reporting functions of this position, she also credits her ability to prioritize tasks as an important skill for her job.

About The Augustana Home

The Augustana Home is a Medicare/Medicaid certified skilled nursing facility that offers short-term rehabilitation, hospice of traditional long-term care plans for elderly residents and other people in need. In particular, Augustana comprehensive services include nursing care, physical, occupational and speech therapy as well as podiatry, dental, audiology, vision care and pharmacy services.

High Tech NEOs

Table 6: High Tech Cluster and Occupations

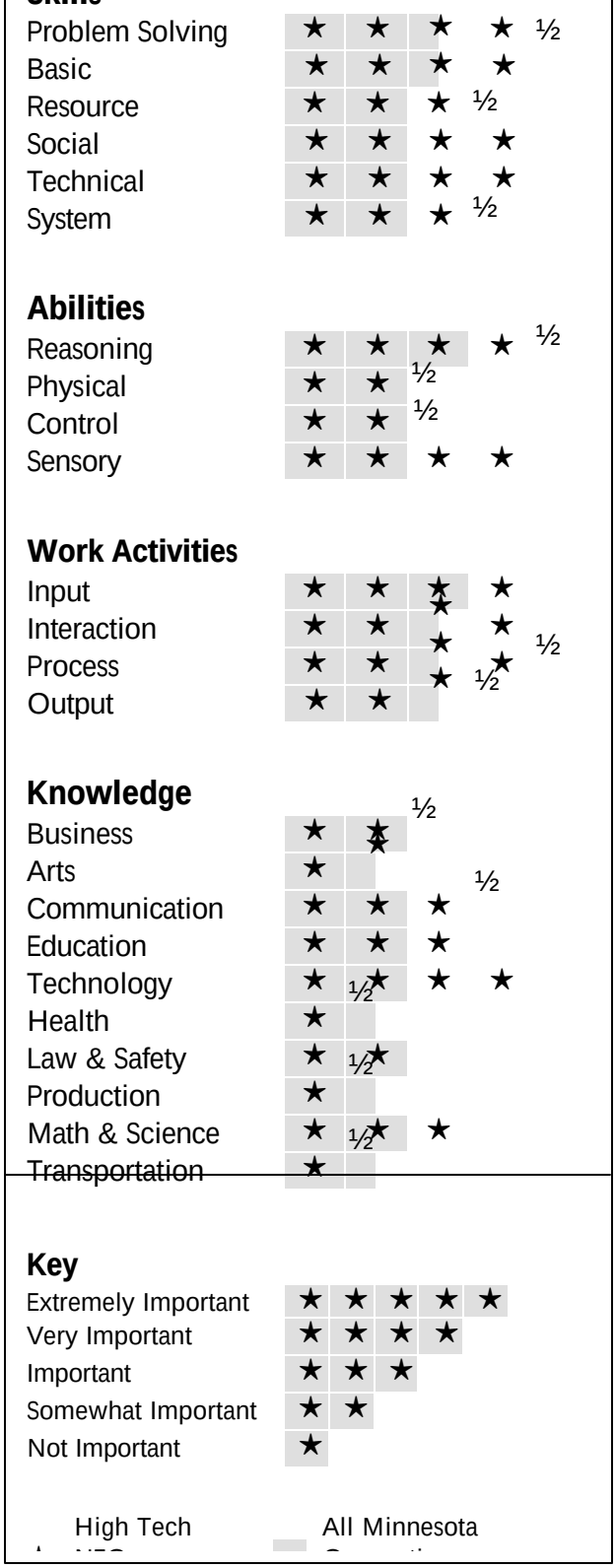
Occupational Subgroups	Employed	New Hires	Job Titles	Industry With Most Titles	Salary Range (full-time workers)
All High Tech	**836**	**270**	**189**	**Service**	**$17,700-114,400**
Application Analyst/Engineer	6	3	6	Health Service	$25,000-88,900
Application/System User	4	3	7	Government	*
Internet Specialist/Technician	49	14	15	Business Service	$19,800-91,000
IT Coordinator/Manager	28	4	15	Government/Service	$23,000-114,400
IT Specialist/Technician	72	17	18	Services	$22,200-46,800
MIS Administrator/Coordinator	37	7	4	Government	$35,600-49,400
MIS Specialist	94	33	7	Non Durable Manufacturing/ Service	$22,000-79,000
Network Administrator	94	18	40	Durable Manufacturing	$25,000-85,000
Network Specialist/Technician	55	15	18	Wholesale Trade	$22,900-55,100
PC Coordinator/Manager	57	15	11	Government	$17,700-96,000
PC Specialist/Technician	313	135	36	Business Service/Service	$19,800-70,200
Programmer/System Analyst	27	6	12	Business Service	$34,632-83,200

* Data not available.

High tech represents the largest of the six occupational clusters in terms of job titles, employment, new hires and occupations with skill data. NEOs in this cluster can be found across industries, but are especially concentrated in the service, manufacturing and government sectors. The most frequently reported occupation in this cluster is a PC specialist or technician. This occupation also had the most new hires (43 percent) for all high tech NEOs. Annual salaries for full-time workers in this cluster varied greatly even at the occupational level. This indicates that workers in these occupations represent a wide range of experience levels, from entry-level workers to high-level managers, and illustrate the variety of high tech needs for firms, from installing software on a few machines to managing an information network for a multinational corporation.

Job titles and descriptions in this cluster reveal that workers in high tech NEOs perform a wide variety of duties. For example, network technicians repair and update a company's networked computer system, while software engineers design software applications for external and internal customers. Job titles in this cluster also reflect the recent growth in computer and information management occupations where the traditional responsibilities of managers (e.g., budgeting and personnel) are fused with a good understanding of technological tools and systems. The occupational categories listed above and the individual job titles listed in Appendix F reflect the variety of job responsibilities in the high tech cluster.

Table 7: High Tech Scores



Education and Skill

The training or education required by employers with NEO high tech occupations range from vocational training for an IT specialist/technician to a masters degree for a MIS administrator/coordinator. A number of occupations also require specialized training in certain product lines, including certifications for Microsoft and Apple software programs and Novell network hardware products.

All told, employers rate all skills, two abilities, four activities and one knowledge for high tech NEOs as either very or extremely important. When these elements are fused together, the skill profile of a high tech NEO worker can be characterized as the team-oriented, technically inclined, problem solver. In particular, employers rate these workers' daily use of technical insight (**reasoning abilities**), capacity to design, set-up and repair applications and machinery (**technical skills** and **technical knowledge**), and capacity to solve complicated problems (**problem solving**) with innovative high tech solutions as very important. At the same time, workers in high tech occupations are regularly compelled to muster their problem solving skills and abilities for a wide variety of customers — externally for customers purchasing a product or service and internally for employees using technological devices they create or set-up (**social skill** and **interaction activity**).

The job description for an Internet specialist highlights this fusion of technical know-how, problem solving and interacting with customers. In addition to software programming and using hyper-text markup language (html) and java script to produce and update web pages for clients, the specialist installs and fixes Internet hardware and software in customer-owned computing equipment, provides technical support to users through phone calls, site visits, and electronic mail. The individual in this position also participates in the creation, editing, and distribution of technical documentation and training materials.

Software Engineer

Problem Solving Skills

Brian Rosenthal graduated with a degree in Electrical Engineering from North Dakota State University in 1984. Before coming to GSI Lumonics three months ago, Rosenthal worked as an electrical and software engineer for several Minnesota firms. While he was originally trained as an electrical engineer, each new position afforded him the opportunity to gain more computer and software programming experience and knowledge through on-the-job training and experience, personal study, seminars and short courses.

As a software engineer for GSI Lumonics, Rosenthal writes software programs for the firm's industrial laser-cutting machinery. The laser cutters that Lumonics builds range in size from desktop models that cut thin sheets of metal to systems that fill a room and cut through quarter inch pieces of steel. Using his programming knowledge of Windows, DOS and C++, he programs an application running on a dual processing system, Windows NT and DOS, which, in turn, interfaces with the laser cutter. Brian works in a cross-functional group of workers, where software engineers, hardware technicians, production staff and sales people all work toward product development, improvement and redesign.

When asked why he isn't using his engineering education, Rosenthal responds that he does use the fundamental skills he acquired in school, namely problem solving skills and the ability to assimilate information, on a daily basis. For him, software engineering is less about the mastery of some new programming language and more about being able to acquire and apply knowledge to build different things for different people in any ever-changing context. According to Rosenthal, it is this flexibility combined with an aptitude and desire for continuous learning that he has come to enjoy in his work.

About GSI Lumonics

Since 1970, GSI Lumonics has become the world's largest manufacturer of industrial laser cutting and drilling systems. Some of the uses of GSI Lumonic's laser cutters include trimming aluminum body panels, cutting feature holes and marking parts for automobile producers, micro-spot weld consumer products like razor blades, and cutting sheet metal for ducting and engine pylons. The company has a production site in Eden Prairie and sales offices and plants located throughout the world.

Information Systems Manager

Systems Skills

Cameron Schaub always wanted to work in the building and home improvement industry. After high school, he went on to complete an associate's degree with a major in architectural drafting and a minor in business management. While the knowledge he gained in school has been important in the overall direction of his career, he feels that additional on-the-job training and short courses at local universities have kept his computer, management and business skills up-to-date.

Before coming to Lamperts a few months ago, Schaub worked as a business manager for another firm. As that company grew and utilized more technological tools in the workplace his responsibilities were expanded to include the set-up and maintenance of the company's computer systems. He returned to school and completed courses on computer installation, maintenance and operation. As Lamperts' information systems manager, Schaub's responsibilities reflect his technical and managerial skills and knowledge. In addition to developing a budget for his department, paying invoices, and managing a staff of technicians, he directs the maintenance, installation and use of technological tools across the entire company.

When asked what specific service he and his staff provide, Schaub replies that he seeks to improve productivity by enabling people to work more efficiently through the use of technology, software or hardware. He maintains that individuals entering the high tech field need to be able to move beyond their technical and systems skills and technological specialization. As a person who hires computer specialists, he states that anytime an applicant can show a greater diversity of skills, such as possessing strong social and problem solving skills, it makes it easier for him to hire them.

About Lamperts

Originally founded in 1887 by two brothers, Jacob and Leonard Lampert, in Sleepy Eye, Minnesota, Lamperts retail lumber business currently operates 37 lumber yards in Wisconsin, Minnesota, Iowa and South Dakota. In addition to lumber, Lamperts sells a full line of building materials such as windows, doors, paint, and carpeting and provides customized assistance for remodeling projects, decks and gazebos, storage sheds and specialty buildings.

Industrial Safety NEOs

Table 8: Industrial Safety Cluster and Occupations

Occupational Subgroups	Employed	New Hires	Job Titles	Industry With Most Titles	Salary Range (full-time workers)
All Industrial Safety	**113**	**16**	**31**	**Durable Manufacturing**	**$20,800-72,500**
Safety Director/Coordinator	112	15	30	Durable Manufacturing	$20,800-72,500
Safety Technician	1	1	1	Government	*

* Data not available.

Safety coordinators, directors and managers compose the majority of occupations within the industrial safety group. As a previously identified new and evolving occupation, safety directors and coordinators job responsibilities generally include monitoring workplace conditions to ensure employee health, comfort and efficiency.

The majority of industrial safety NEOs can be found in the durable manufacturing sector. Out of all six clusters, employers with occupations in this cluster report the smallest number of new hires (14 percent) and no current position vacancies.

Occupational change in this cluster is driven primarily by changes in workplace organization and legal requirements. The job titles and descriptions supplied by employers reflect these trends with the emphasis placed on designing company policies that take into account state and federal safety regulations and ramifications of internal firm changes, such as the acquisition of new machinery. Safety NEOs are also responsible for maintaining records on safety, training employees on safety issues and coordinating with other agencies on safety issues.

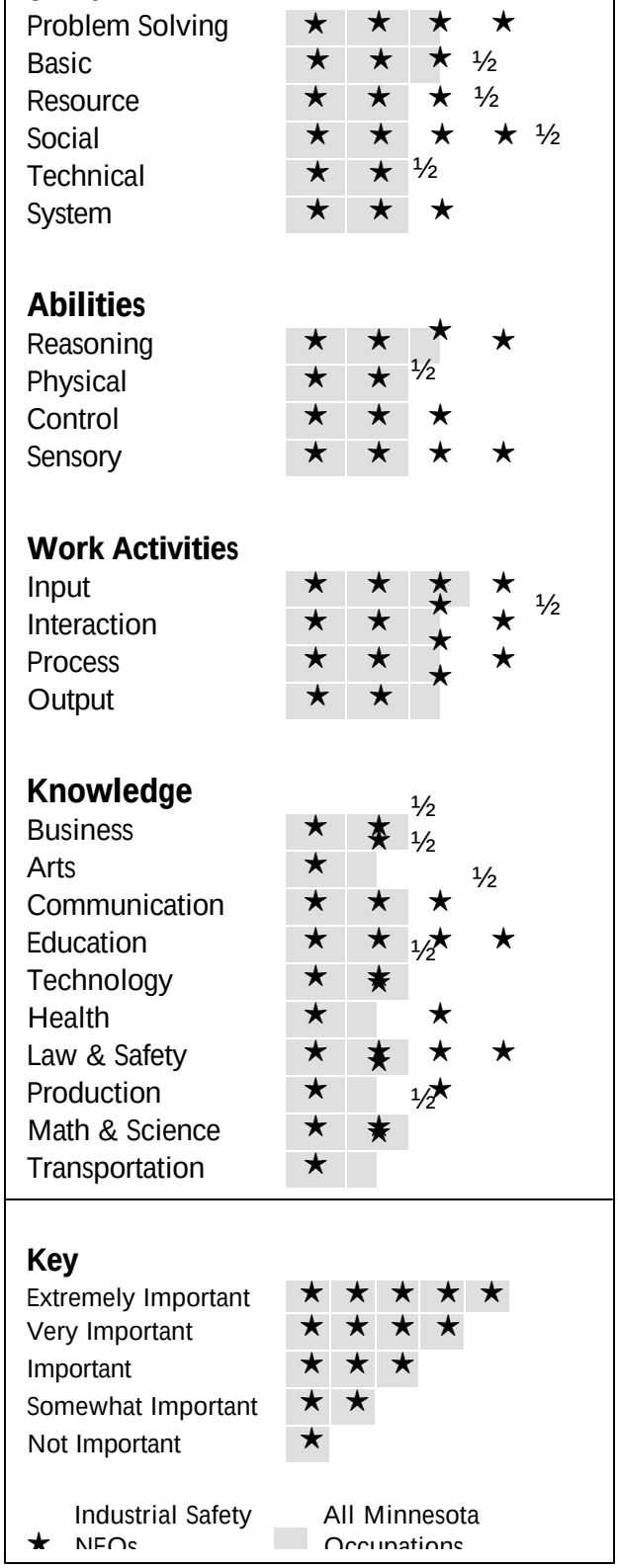
Table 9: Industrial Safety Cluster Job Titles

Cluster/Job Titles	Number of Titles	NEO Status
Safety Coordinator/Director	**30**	
Safety and Training Division Manager	1	Evolving
Safety Coordinator	4	Evolving
Safety Designer	1	Evolving
Safety Director	19	Evolving
Safety Director/Plant Superintendent	1	Evolving
Safety Manager	2	Evolving
Safety Officer	1	Evolving
Safety Officer/Risk Manager	1	Evolving
Safety Technician	**1**	
Inspection Technician	1	Evolving

Education and Skill

On average, new and evolving occupations within the industrial safety cluster require an associate's degree as a minimum level of education and training. The majority of the responses indicate that no additional license, certification, or registration is required for employment. For those occupations with additional prerequisites, the requirements reflect specific job tasks. For one safety

Table 10: Industrial Safety Scores



director, whose job description indicates the position oversees the safety of bus drivers, a Class B license is required. For a safety officer, responsible for maintaining OSHA standards in the workplace and for the safety of employees and guests, knowledge of regulations set by the Occupational Safety and Heath Administration (OSHA) is required, along with an Emergency Medical Technician (EMT) certification.

The high rating given to social interaction (**social skills** and **interaction activity**) reflects the importance placed on an individuals ability to work with fellow employees to achieve a broad base of safety goals and regulations within the company. Job descriptions for these occupations also indicate the significance of problem solving and the ability to monitor a variety of sites on the job. These duties reflect the high ratings given to both **reasoning** and **sensory abilities**.

The job description for a safety director/coordinator embodies the strong scores given to **law and safety**, **communication** and **education knowledge**. The individual in this position is responsible for overall direction of the firm's safety programs. This person coordinates policy implementation efforts between management and field offices and continuously evaluates the effectiveness and requirements of the program. He or she advises managers and supervisors on pertinent safety matters and, in cooperation with management superintendents, determines the necessity for personal protective clothing and equipment for safety purposes. He or she also approves the selection of articles to be purchased and supplied and ensure that any equipment, tools, and machinery have safety approval prior to their purchase. In addition, the safety director periodically conducts safety evaluations at the job site to ensure that company safety policies are properly addressed and enforced.

Safety Director

Social Skills

Patrick Hagerty has occupied just about every position at Boston Health Care Systems during his 15 years with the company. Seven years ago Hagerty became the human resources director and, due to company growth, increasing insurance compensation costs and legal requirements, his position gradually evolved from human resource issues to also include the responsibilities of the safety director at the firm. As a result of this evolution, Hagerty, who holds a masters degree in psychology at the University of Chicago, has had to learn a lot about safety issues through seminars and research on the job.

Hagerty recalled that his company went from operating safety programs passively, such as ensuring that the physical work site was safe and well maintained, to developing a more active and encompassing safety plan for the firm. Today, every employee is expected to go through a number of training programs, many of which are oriented toward safety concerns. For example, one of the principal programs is designed to show staff how to effectively deal with behavioral situations where both the client and caregiver's safety may be at risk or where a situation has already escalated toward a dangerous level. The principal aim of the program is to minimize the danger of injury to both staff and clients. Since implementing this program, the number of OSHA (Occupational Safety and Health Administration) reported injuries at Boston Health Care has dramatically declined. Hagerty also oversees programs designed to control the spread of infections and blood-borne pathogens.

Since Hagerty works with both clients and staff on a daily basis to resolve safety concerns, he credits the ability to listen carefully and compassionately as his most important skill. In addition, he also values his technical abilities and attention to detail as skills that are needed to keep track of personnel and injury records.

About Boston Health Care Systems, Inc.

Boston Health Care Systems, Inc. is a privately owned service organization established in 1980, which provides residential services to mentally ill and mentally retarded persons. Services offered by Boston Health Care include long term residential care, semi-independent living services, behavioral and psychological consultation and advocacy in legal and program areas.

Management and Administration NEOs

Table 11: Management and Administration Cluster and Occupations

Occupational Subgroups	Employed	New Hires	Job Titles	Industry With Most Titles	Salary Range (full-time workers)
All Management and Administration	**34**	**21**	**26**	**Durable Manufacturing**	**$21,800-115,000**
Assistant/Specialist	8	5	6	Government	$31,800-37,400
Coordinator	8	5	8	Durable Manufacturing	$29,600-70,200
Marketing and Sales Assistant/Specialist	4	4	6	Wholesale Trade	$21,800-27,000
Project Leader/ Coordinator	14	7	6	Business Service/ Retail Trade	$33,200-115,000

The management and administration cluster includes a wide variety of occupations, from those who perform marketing and sales functions for a company to staff who manage, lead or coordinate a wide variety of projects for a firm. The job titles listed below reflect the diversity of responsibilities for occupations in this cluster (see table 9). The number of industries listed for each occupational category also illustrates the diversity of this cluster (see Table 8). Even with this diversity, the majority of management and administration NEOs can be found in the durable manufacturing sector.

Table 12: Management and Administration Job Titles

Cluster/Job Title	Number of Titles	NEO Status
Management and Administration Assistant/Specialist	**6**	
Client Development Specialist	1	Evolving
Curriculum Integration Specialist	1	New
Engineering Assistant	1	Evolving
Grants Specialist Senior	1	Evolving
Planning Assistant	1	Evolving
Restorative Justice Specialist	1	New
Management/Coordinator	**8**	
Development Director	1	Evolving
Human Resources Manager	1	Evolving
ISO Coordinator	1	New
ISO Deputy Compliance Officer	1	New
New Business Venture Project Manager	1	New
Occupational Health Coordinator	1	Evolving
Organizing Director	1	Evolving
Utilization Manager Director	1	Evolving
Marketing and Sales Assistant/Specialist	**6**	
Internet Specialist Sales	1	Evolving
Marketing Assistant	1	Evolving
Marketing Coordinator	2	Evolving
Sales and Warehouse Support Specialist	1	Evolving
Sales Department Administrator	1	Evolving
Project Leader/Coordinator/Manager	**6**	
Project Coordinator	2	Evolving
Project Leader	1	Evolving
Project Manager/Consultant	3	Evolving

Overall, internal workplace changes and customer needs are the primary factors prompting change in this occupational cluster. In addition, almost two-thirds of the workers in this NEO cluster, more than any occupational grouping, are considered new hires.

Education and Skill

Consistent with the educational and training level required for all new and evolving occupations, management and administration positions, on average, also require an associate's degree. A wide variety of licensure requirements for management and administrative occupations exist, depending on the type of work that is being done. An

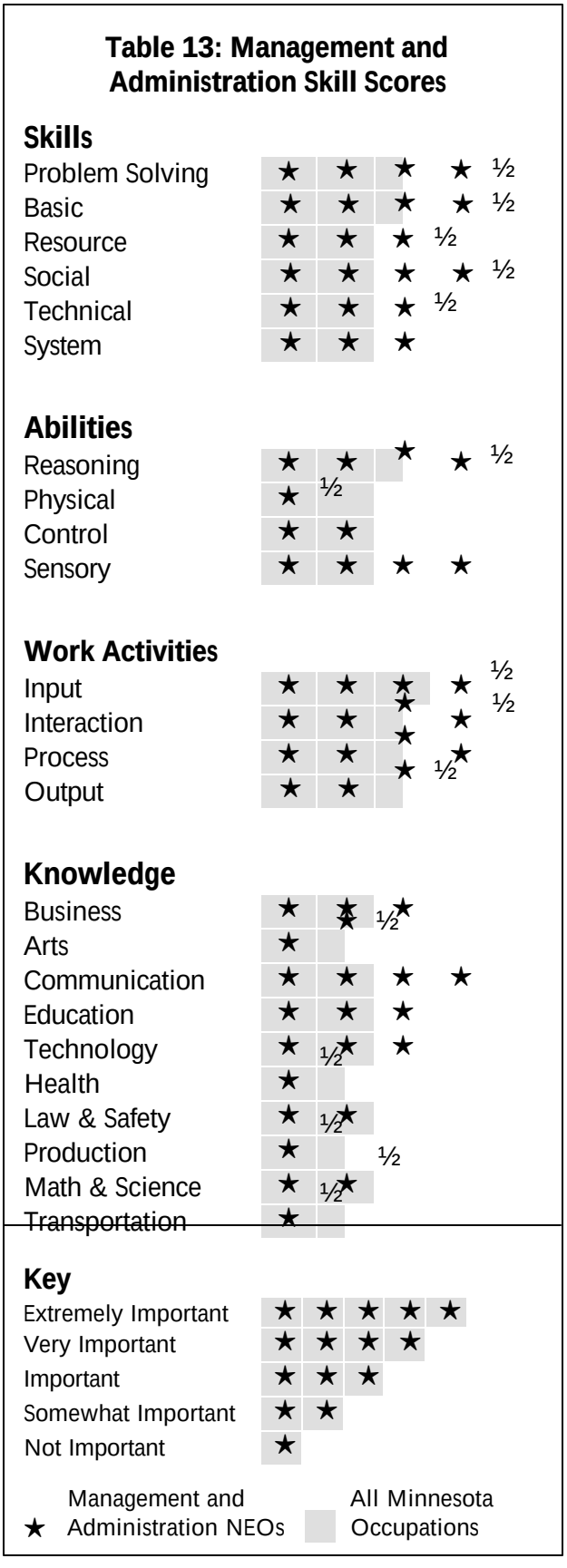
occupational health coordinator is required to obtain a Licensed Practical Nurse (LPN) license, while a curriculum integration specialist is required to obtain a teaching license. The majority of management and administration occupations, however, do not require any licensure, certification, or registration.

Employers rate **problem solving**, **basic** and **social skills** as very important to job performance. The ability to acquire and apply knowledge in problem solving (**reasoning abilities**) is considered most important to job performance. Since the central duties for management and administrative staff, especially project leaders and managers, may include staff and/or project management, the ability and knowledge of problem solving is essential to job performance. **Sensory abilities** are also considered important to job performance, while the ability to handle and control objects in the workplace (**control abilities**) and **physical abilities** are rated as unimportant to job performance.

Management and administrative NEOs work in a team-orientated environment (**interaction activity**) where workers must be adept at planning, problem solving, decision-making (**process activity**) and information gathering (**input activity**). The job position description for a marketing coordinator when **communication knowledge** is added illustrates the importance of these aspects.

While the marketing function remains the same, the duties performed by marketing coordinators are now more diverse and stretch across all aspects of the firm. According to one employer's position description, a coordinator must primarily have strong communication skills and be able to coordinate requests from all areas of the company. He or she must have knowledge of all divisions and their respective sales/order processing functions and have computer and database management experience. The person in this position must be organized and possess strong leadership skills. The marketing coordinator also has a leadership role in the implementation of effective sales force automation and, as a result, coordinates with all departments and groups with the company at all locations to provide an integrated solution.

Table 13: Management and Administration Skill Scores



New Business Ventures Project Manager

Resource Management Skills

Scott Schreiner graduated with a bachelor's degree from the University of North Dakota with a double major in management and marketing. A few years after graduation, Schreiner joined Northern Tool and Equipment as a management trainee in the purchasing department and eventually became the buyer for the firm's assembly department. He worked his way through the managerial ranks to become purchasing manager for K-Bar Industries, a company that is commonly owned by Northern Tool and Equipment. After five years in this position he was recently reassigned to a newly created position: new business ventures project manager.

Many of the responsibilities of his old position, namely import purchasing, remain as part of his current responsibilities. Schreiner's new responsibilities in this position, however, include investigating new manufacturing processes and evaluating how to improve the current programs and production methods in order to reduce costs, increase their overall competitiveness in the industry and work toward the firm's self-sufficiency. In fact, the position itself grew out of a changing managerial structure in the company that was brought on by new business opportunities and fast firm growth.

Schreiner sees each new project as an educational process primarily because he starts out with a limited knowledge of how a new production process actually works. He relies on the firm's engineering staff and outside vendors and suppliers to provide technical assistance, and on his own research conducted at the library or on the World Wide Web to investigate new production methods. Since Schreiner's projects are varied and have different deadlines, he credits the ability to manage and plan projects as being the most important skills for his job.

About K-Bar Industries

Founded in 1991, K-Bar Industries was initially located in Savage and Burnsville, before it moved to its current location in Faribault in 1994. Currently employing over 200 employees, this small equipment manufacturer's main product line includes hot and cold pressure washers, generators, chemical sprayers and log splitters. In addition to these products, K-Bar also manufactures heavy-duty carts and wagons and stands for speakers.

Printing and Publishing NEOs

Table 14: Printing and Publishing Cluster and Occupations

Occupational Subgroups	Employed	New Hires	Job Titles	Salary Range (full-time workers)
All Printing and Publishing	**353**	**83**	**30**	**$14,600-49,100**
Desktop Publishing Specialist/Technician	155	32	9	$14,600-31,200
Electronic Pre-Press	48	12	9	$22,200-49,100
Paginators	16	4	4	$16,600-25,000
Press Operators	124	25	3	$29,300-37,900
Printing Supervisors and Technicians	10	10	5	$16,600-32,800

The printing and publishing cluster is composed of new and evolving occupations that are specific to one industry. Most of the NEOs within the printing and publishing cluster were identified in an earlier examination of new and evolving occupations, including desktop publishing specialist, electronic pre-press operator and paginator. The large number of job titles in this sector point to the fact that the on-the-job activities for printing and publishing occupations are varied.

For example, press operators are responsible for pre-testing production reliability, correcting problems, and routing print product film, while paginators position electronic pages to fit press specifications and layouts. Paginators output paginated pages to film and produce a laser proof of the products for customers to inspect before a film is produced and sent to press. Even though each occupation has a distinct role, each one fulfills a function that is an integral part of the printing and publishing process.

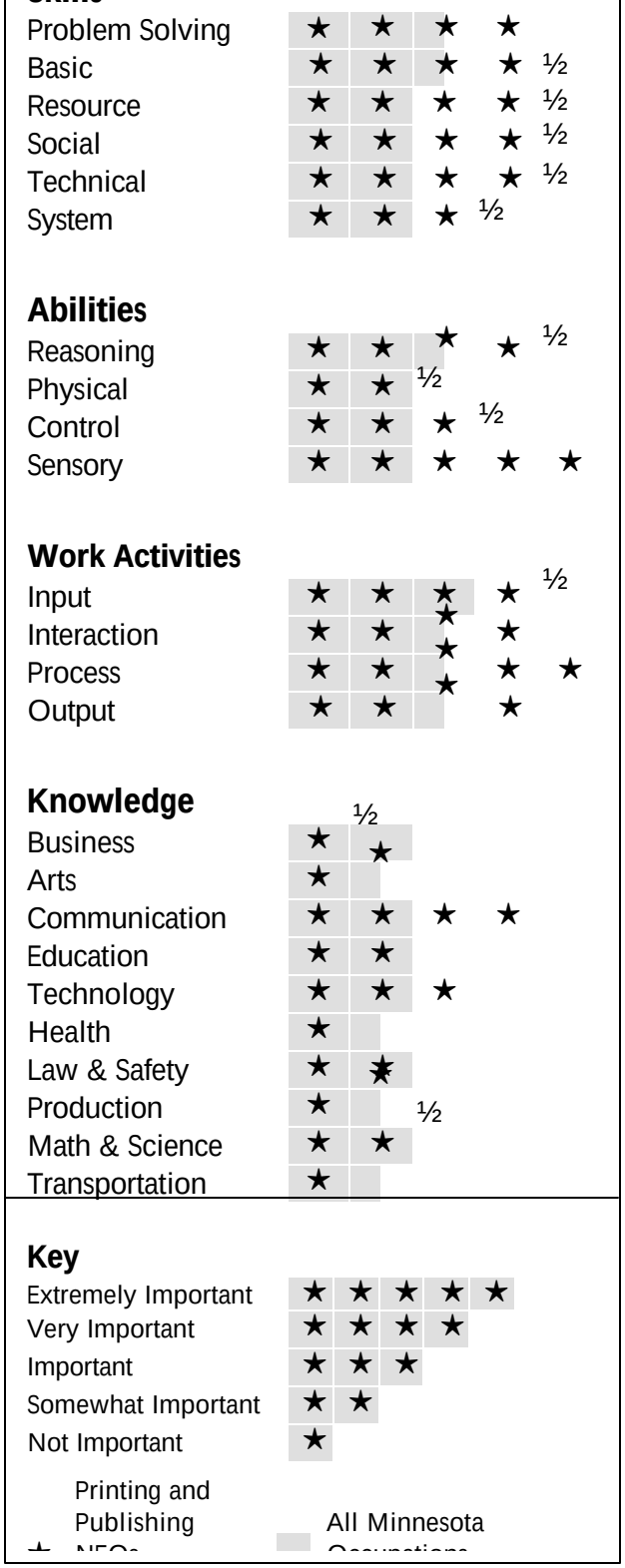
Table 15: Printing & Publishing Job Titles

Cluster/Job Title	Number of Titles	NEO Status
Desktop publishing	**9**	
Desktop publishing specialist	8	Evolving
Desktop technician	1	Evolving
Electronic pre-press		
Electronic pre press operator	4	Evolving
Electronic pre-press planner	3	Evolving
Electronic pre-press operator/desktop assembly operator	1	Evolving
Electronics pre-press image assemblers	1	Evolving
Paginators	4	
Pagination and electronic pre-press	1	Evolving
Paginator	2	Evolving
Paginator imposition assembly operator	1	Evolving
Press operators	**1**	
Press operators	1	Evolving
Multi press operator	1	Evolving
Multicolor press operator	2	Evolving
Printing supervisors, operators and technicians		
Computer graphics input manager	1	Evolving
Computer typesetter for print jobs	1	Evolving
Creative systems supervisor	1	Evolving
Graphics reprographics tech	1	Evolving
Laser print operator	1	Evolving

Education and Skill

On average, printing and publishing NEOs require a high school diploma or GED, plus work experience, for minimum education and training. This level of training is below the average training required for all new and evolving

Table 16: Publishing and Printing Scores



occupations, which is an associate's degree. In addition to the lower education and training level required, no additional license, certification or registration is reported for these occupations.

All told, employers rate five out of six skill categories as very important. Besides having a foundation of reading, math and science skills (**basic skills**), these occupations require strong **problem solving**, **resource**, **social** and **technical skills**. All four of the general work activities also rate as very or extremely important. The ability to acquire and apply knowledge in problem solving (**reasoning abilities**), along with **sensory abilities** are rated as very and extremely important. Surprisingly, **physical abilities** is not important for this cluster of occupations. At the individual job level, however, **physical abilities** remains extremely important for press-operators, but much less important for other printing and publishing jobs (see Appendix G for job distinct ratings).

Consistent with other new and evolving occupations, knowing how to deliver information (**communication**) is rated as very important for job performance. Knowledge of the design, development and application of technology for job specific tasks (**technology**) is, on average, important for all occupations in this cluster. For desktop publishers and electronic pre-press operators and planners, however, technical know-how is considered to be more important as more printers move away from manual printing methods to computerized layouts and digital imaging techniques.

For example, the job description for one desktop publishing specialist describes how this individual performs design and layout activity using desktop publishing software, such as Quark and Adobe graphics products, to create a variety of print products. The person in this position also opens and modifies electronic files from customers and checks for and corrects design problems in these files.

Desktop Publishing Technician

Reasoning Ability

Julie Sicheneder's interest in printing began in high school. She enrolled in a graphics arts course as a junior and participated in a work study program during her senior year working for a local printer as a typesetter and keyliner. Following high school, Sicheneder enrolled in a graphic arts program at Hennepin County Technical College and took courses in layout and design, typesetting, keylining and camera. After briefly working as a typesetter for a business card company, she was hired by Daily Printing as a typesetter.

In her 16 years at Daily Printing, Sicheneder has seen her responsibilities grow and change. Due to technological changes in the printing industry, her position has gradually evolved into that of a desktop publishing technician at the firm. As one member of a team of desktop technicians, Sicheneder reviews and prepares a variety of print jobs before they go to press. In particular, she applies her knowledge of the printing processes and software tools, such as Quark and Adobe Illustrator, to detect potential problems with electronic documents supplied by customers and solve them before they are imaged onto film.

When asked what is the most challenging aspect of her job, she responds that keeping up-to-date with all of the new software tools can be formidable especially because new products or updated versions are released all the time. In addition to having the capacity to learn and apply new software tools, Sicheneder maintains that the ability to troubleshoot problems and communicate effectively with team members and other employees are crucial to her everyday job performance.

About Daily Printing, Inc.
Since 1950, Plymouth-based Daily Printing has provided printing services to a number of local corporations, small companies and individual clients. Daily is a full service printer offering a variety of services to clients, including print estimating and planning, preflight checks of electronic documents, as well as a comprehensive set of prepress, printing, bindery and product delivery services. Daily Printing is an employee-owned company with a staff of over 100 employees and more than $17 million in annual reported sales.

Quality Control NEOs

Table 17: Industrial Safety Cluster and Occupations

Occupational Subgroups	Employed	New Hires	Job Titles	Industry With Most Titles	Salary Range (full-time workers)
All Quality Control	**72**	**22**	**27**	**Durable Manufacturing**	**$16,000-69,500**
Quality Analyst/ Auditor	24	7	13	Durable Manufacturing	$16,600-49,400
Quality Coordinator/ Supervisor	48	15	14	Durable Manufacturing	$33,300-69,500

Previously identified as a new and evolving occupation, quality auditors are responsible for examining and analyzing quality programs in a company, while quality coordinators and supervisors have the job of developing and overseeing quality control programs in a company. Employers who responded to the survey report that slightly more than one-quarter of all workers in the cluster were considered new hires. Almost all quality control NEOs can be found in firms in the durable manufacturing sector.

Table 18: Quality Control Cluster Job Titles

Cluster/Job Title	Number of Titles	NEO Status
Quality Analyst/Auditor	**13**	
Quality Assurance Analyst	1	New
Quality Auditor	12	Evolving
Quality Coordinator/Supervisor	**14**	
Manager of Analysis and Quality	1	Evolving
Quality Assurance Manager	1	Evolving
Quality Control Manager	2	Evolving
Quality Coordinator	4	Evolving
Quality Coordinator/Director	4	Evolving
Quality Engineer	1	Evolving
Quality Manager	1	Evolving

The titles in this cluster reflect the trend in firms toward the implementation of quality programs beyond the measurement of product quality to include a "total quality" approach that includes a quality examination of all aspects of company performance, such as customer services, worker training processes and computer systems. Quality control workers, depending on their management status in the firm, may also lead teams of quality analysts and other employees when addressing quality issues or implementing quality system programs.

According to a number of position descriptions, preparing the company for ISO 9000 certification is one of the key job specific tasks for workers in quality control occupations. The term "ISO" refers to the voluntary member-based International Standardization Organization located in Switzerland that creates a variety of quality standards on products, processes and information technology. Firms that are ISO 9000 compliant meet such standards.

Education and Skill

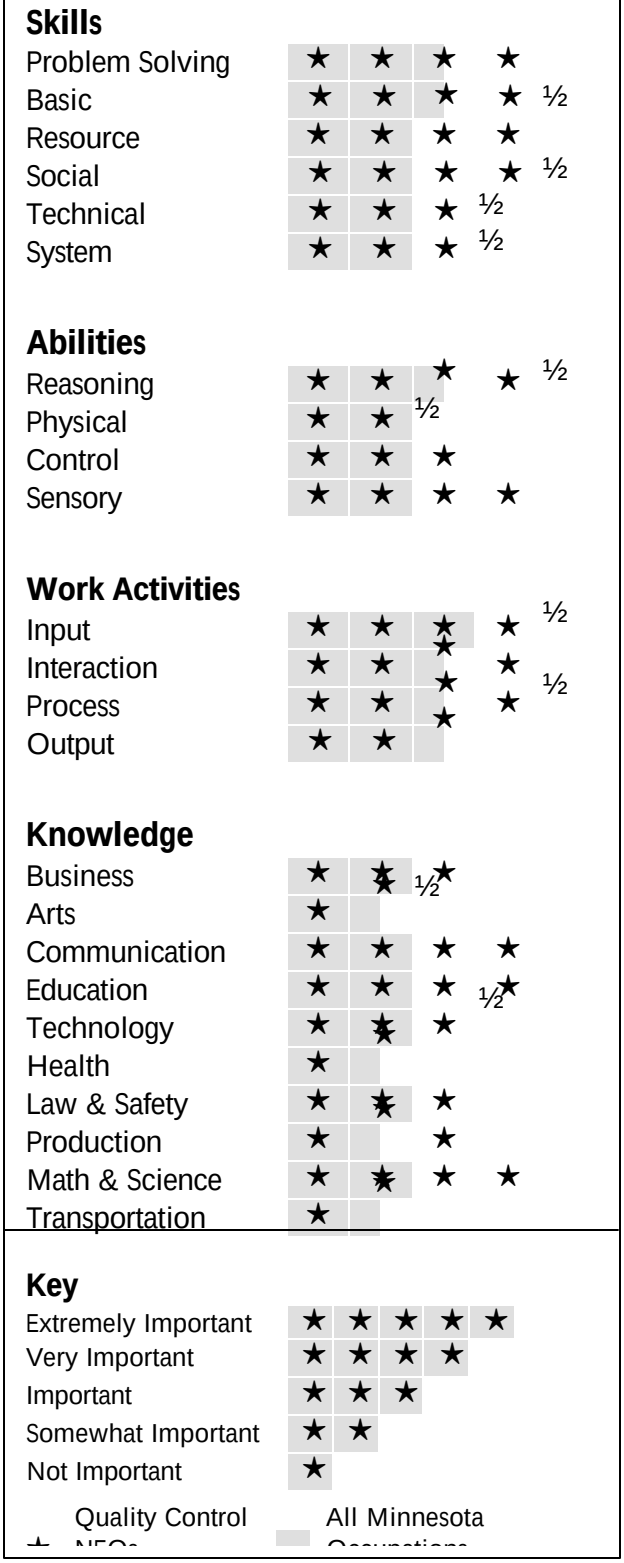
A wide variety of education and training levels are accepted as the minimum requirement for quality control occupations. The minimum requirement ranges from a high school diploma or GED plus more than 12 months on the job training to a professional degree. On average, employers require a bachelor's degree. For certain occupations, additional certification is also needed for employment. A manager of analysis and quality assurance, for example, requires an internal auditing certification for employment. The majority of the quality control occupations, however, do not require any additional licensure, certification, or registration.

Basic and **social skills** are considered extremely important to job performance for quality control occupations. The high level of importance attached to these skills reflect the direct contact with other people on the job and the importance of basic reading, math and science skills to completing job tasks. Although **technical** and **system skills** have the lowest importance rating for quality control occupations, they are both considered important to job performance.

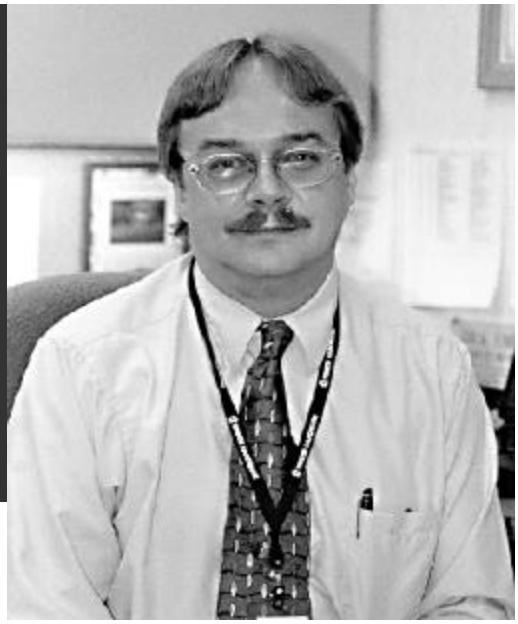
Like other NEOs, the combination of **reasoning** and **sensory abilities** is rated as very important. On a daily basis, workers in quality control NEOs are required to gather information (**input activity**), plan, problem solve and make decisions, (**process activity**) and interact with or supervise other workers with regard to successfully completing job specific tasks.

The high level of importance attached to three knowledge sets, **communication**, **education**, and **math and science**, reflect the need for workers in this occupational in this cluster to adeptly use technical principles to develop quality control procedures and instructional techniques to implement such measures in the workplace.

Table 19: Quality Control Scores



Director of Quality



Systems Skills

Dick Emery worked as a product inspector while completing his degree in Engineering at the University of Northern Iowa. After working for other companies as a quality engineer, he took a job at Truth Hardware as a second level quality engineer. Over time, Emery worked his way up the managerial ranks and into his current position, Director of Quality. In addition to the technical knowledge he gained during school, he is quick to credit his "real world preparation" at the university, which consisted of team and project work and courses in management and supervision, as a necessary component to carrying out the responsibilities of his current position.

As Truth Hardware's Directory of Quality, Emery manages a staff of five engineers and auditors in the quality assurance unit, oversees and monitors five organization-wide teams (measurement, improvement, audit, training and special projects), and is responsible for the establishment and implementation of "total quality" programs in the company. According to Emery, the role of quality at Truth Hardware has gradually evolved from a focus on output or products to a comprehensive examination of all processes, systems and services that impact company performance. Consequently, he and his staff are involved with all facets of the firm. Ultimately, he sees the role of his department at Truth Hardware as one of devising systems or procedures that can empower employees to be able to review the quality of their own work.

In addition to strong social and systems skills, Emery maintains that individuals entering the quality field need to have a burning desire to improve systems, products and processes. Because quality staff members lead teams that work on a variety of projects, each worker must also be an adept project manager who is capable of communicating with people at all levels, cultures and languages and can easily move from overwhelming technical details to everyday language.

About Truth Hardware

Truth Hardware has manufactured window and door hardware in Owatonna since 1955. Today, the company employs nearly 850 people and has a line of over 100 different products that range from simple or complex hinges, operators and multi-point patio door locking handles, to the sophistication of remote-controlled, motorized operators for windows and skylights. Truth Hardware sells directly to such major window manufactures as Marvin Windows, Pella, Andersen, Eagle, Crestline and Vetter.

Chapter Three
Conclusion

Findings from the 1998 New and Evolving Occupations Survey reveal that employers need adequately educated and/or trained workers who are highly skilled to fill cutting edge jobs at their company. Almost all workers in NEOs need to have some degree of formal training or have completed a college or vocational degree. The average educational requirement for NEOs is an associate's degree. Yet for employers the possession of a formal degree doesn't always guarantee good job performance. In addition to things that they learned in school, workers in these jobs need a strong set of skills.

Workers in NEOs need to be self-directed team-oriented problem solvers. They also need to be able to eagerly adapt to the changing terrain of the workplace. Employees in NEOs, therefore, must be ready to adapt to a variety of workplace changes, such as new technological tools or new management practices. Employers with new and evolving occupations need workers who meet challenges head-on and can easily apply core reading, math, and science skills to identify, process, and analyze information and data every day. As a result, employers aren't looking for workers who enjoy dead-end jobs where the same mundane tasks are performed daily. Survey results and job profiles with NEO workers strongly suggest that employers will seek out workers with a flexible set of skills and abilities who can continuously build on their knowledge base by remaining active, life-long learners.

Due to a number of occupational change factors, including new customer needs and legal requirements, workers in NEOs are also moving beyond the traditional responsibilities that may have defined their jobs in the past. For instance, the responsibilities for a number of health service NEO workers now include planning, coordination, and program evaluation along with traditional health care responsibilities. In addition, high tech NEO workers who also serve as coordinators or directors now must add to their technical expertise by becoming adept at managing staff and allocating resources. What's more, new and evolving occupations that may reflect a more technical orientation, such as Internet specialists, webmasters or desktop publishing specialists, also include duties which necessitate working with customers, writing user-friendly manuals, and helping the most novice user make sense of new technological devises, systems and processes.

Professional trainers and educators will want to pay close attention to new skill needs and incorporate them into training and educational programs to ensure that their students and clients are well prepared to meet changing employer demands. Since employers demand workers with higher levels of skills, knowledge and abilities in NEOs, those who are planning future careers, especially students, job seekers and careers shifters, will also want to identify and obtain the set of skills for the particular job they want to pursue.

In sum, new and evolving occupations embody many of the dynamic changes taking place in the Minnesota workplace brought on by new technologies, customer needs, new regulations, reorganization and heightened competition. To be successful in navigating this ever-changing environment, workers must have a core set of skills, abilities and knowledge that are practical and elastic.

Appendices

Appendix A

Methodological Note

In mid-November, 1998, a survey was mailed to 5,700 firms covered by Minnesota's Reemployment Insurance Tax Law. These firms were randomly selected from a representative population of firms based on a sampling procedure that stratified by firm size (5 to 24 employees; 25 to 74 employees; 75 to 249 employees; and 250 or more employees), industry (agriculture; construction; finance, insurance and real estate; government; durable manufacturing; non-durable manufacturing; printing manufacturing; mining; business services; health services; all other services; retail trade; wholesale trade; and transportation, communication and public utilities) and location (Greater Minnesota, Minnesota metropolitan statistical areas and Minneapolis/St. Paul).

Using a randomly drawn list of employers, a postcard reminder, follow-up calls and additional survey mailings were used to increase the survey response rate from December to March. By the end of March, 965 firms (16.9%) had responded to the survey. From these surveys, over 492 job titles were grouped into six larger occupational categories and reviewed by analysts to establish their NEO status. At the end of March, analysts reviewed these job titles along with each job description that employers provided and grouped these titles into six larger occupational categories:

- Health Service
- High Tech
- Industrial Safety
- Management and Administration
- Printing and Publishing
- Quality Control

After clustering job titles, analysts reviewed each job title and description to establish their NEO status. The criteria for establishing NEO status is similar to the methodology used in the Bureau of Labor Statistics Occupational Employment Statistics (OES) program to determine which titles represent new and emerging occupations. The annual OES survey asks employers to indicate the number of workers employed by occupation. Occupations from firms with over 50 employees that do not fit into established categories are added into an "all other" category. OES analysts, in turn, carefully review these titles and descriptions for new and emerging titles. For this study, MDES analysts reviewed each title and description and compared it with the established OES occupations (roughly 800 occupations) according to the following procedure. In the first stage of the review process, titles and descriptions that matched established OES occupational categories exactly were removed. The 191 titles that remained were distilled into three categories characterized as new or evolving based on the following criteria:

Evolving Occupations

- Jobs with titles that matched OES occupations, but whose job descriptions showed that the specific job duties and worker knowledge and skill were significantly different from the established job description.
- Jobs with titles that were similar or that could be fit within an OES category and which showed that the specific job duties and worker knowledge and skill were significantly different from the established job description.

New Occupations

- Jobs with titles that could not be matched with any OES occupation or definition.

Following this process, 31 titles were judged to be new while 160 titles were deemed evolving. Of the 160 evolving titles, 72 matched the criteria of an evolving job with a matching OES category and are clearly different job description. The remaining 88 titles matched the criteria of a new job with no matching OES titles and a clearly different job description.

One occupation from each of the six occupational categories was also selected for an in-depth profile. Due to the significant number of high tech NEOs, two occupations were selected from this occupational category. For each profile, analysts conducted a workplace visit and brief interview with the job incumbent in order to obtain information about their personal background, training and education, specific job tasks, and employment path. Detailed employer information was also obtained at this time.

The skill, ability, activity and knowledge scores for all Minnesota occupations were calculated using O*NET scores that were linked to occupational employment estimates for 1996 from the Minnesota Employment Outlook (1996-2006) through an occupational crosswalk. An average for each category was computed by weighting each score by employment in that occupation.

Lastly, the graphs that illustrate the projected distribution of NEOs by industry, size and location that are found on pages 1 and 2 are based on the distribution of firms with or without these occupations. In order to illustrate projected NEO patterns for the entire state, the survey results are weighted to be representative of the universe of firms in Minnesota. See Appendix D for more information of the distribution of the NEOs by industry, size and location.

Comparison with the MDES 1997 New and Emerging Occupations Study

This study is similar to New and Emerging Occupations (1997) study conducted by the Research and Statistics Office of the Minnesota Department of Economic Security in that it seeks to identify new occupations and skill trends. For example, the survey used in 1998 also asked employers to provide information on wages, hours worked, number employed in the position, how many employees were hired for the position in the past year, and what factors contributed to changes in the workplace. Yet the current project departs from the previous NEO project in several distinct ways.

First, the TRACS taxonomy (Team, Resources, Analysis, Communications, and Systems) previously developed for identifying skills was replaced with an O*NET (The Occupational Information Network) skills taxonomy. The inclusion of O*NET based skill categories allowed for the acquisition of more in-depth information, including job knowledge, worker ability and work activities, the chance to compare survey findings to state occupational patterns, national information and the opportunity to include findings in other MDES projects that also use O*NET. For more information about O*NET, see Appendix C.

Second, the 1998 survey instrument was expanded to include occupation-specific information, such as job descriptions, and standardized to include twelve established educational and training categories. The 1998 survey instrument also encouraged employers with no NEOs to respond and invited employers who did not want to complete the entire survey to respond to section one of the instrument in order to scale the survey's findings to the Minnesota economy.

Third, the procedure for drawing the sample was altered by expanding the number of industrial sectors and geographic regions in an effort to improve the overall response rate and survey findings. Lastly, the criteria for establishing NEO status was expanded to include a comparison between the job description provided by employers and those contained within the Occupational Employment Statistics program.

Appendix B

About O*NET

Responding to the need for an up-to-date occupational information resource, the U.S. Department of Labor's Employment and Training Administration, as part of its comprehensive workforce development strategy sponsored the development of O*NET in 1994. Five state-based Occupational Analysis Field Centers, four Assessment Research and Development Program Centers, firms competitively selected from the private sector, and public and private sector members of the national O*NET consortium were brought together to implement the project, collect data, design the database viewer and maintain database maintenance functions.

The first version of the database viewer, O*NET 98, was released in November 1998. The database used in this prototype version is based largely on data supplied by occupational analysts from field research and from the most recent version of the Dictionary of Occupational Titles (DOT). Using data from the 1991 DOT, analysts evaluated and refined existing occupational data and applied this information to the 1,122 occupations found in the O*NET coding structure. At present, an extensive effort is underway to collect new and expanded data for these occupations based on job profiles conducted across the nation. These data will be incorporated in the complete O*NET database, currently scheduled for release as O*NET 2001.

The O*NET 98 database identifies, defines, and describes the comprehensive elements of job performance in the ever-changing world of work. It contains information on job requirements, worker attributes, and the content and context of work, capturing what people do as functions of their roles within organizations. The framework that organizes O*NET data is a skills-based structure called the Content Model. The content model classifies occupational data into six domains or windows that look into all aspects of the workplace, from the characteristics of workers to job requirements. With comprehensive terms designed to incorporate occupational descriptions across all sectors of the economy, the domains of the content model standardize the way that occupational information is defined and described.

The NEO survey instrument incorporates the language of four O*NET skills categories; namely abilities, general work activities, skills and knowledge, in the "worker skill sets" section of the survey (see Appendix E). Subcategories of these four larger groups were used, instead of specific questions for each category, in order to gather more information about each occupation and reduce the size of the survey. For this survey instrument, for example, the abilities category employs four O*NET subcategories (reasoning, physical, sensory and control abilities). In the full version of O*NET 98, the abilities category measures 52 distinct abilities. For researchers interested in using the O*NET taxonomy, the following appendix contains details on the distinct levels that constitute the four groups and 24 subcategories of the skill set.

This first public release of O*NET, known as O*NET 98, is being distributed by the Government Printing Office (GPO). The O*NET 98 Viewer and Data can be downloaded from the web at no cost (www.access.gpo.gov/o_net/) or obtained from the GPO for a small cost by calling 1-(202) 512-1800. For more information on O*NET, see the DOL's Employment and Training Administration's website: www.doleta.gov/programs/onet. For questions about O*NET and information about its use in other Minnesota projects, please contact Michael Grover at (651) 297-8270 or mgrover@ngwmail.des.state.mn.us.

Appendix C

O*NET Skills Taxonomy

Abilities

Reasoning
Cognitive Abilities
Oral Comprehension
Written Comprehension
Oral Expression
Written Expression
Fluency of Ideas
Originality
Problem Sensitivity
Deductive Reasoning
Inductive Reasoning
Information Ordering
Category Flexibility
Mathematical Reasoning
Number Facility
Memory
Memorization
Speed of Closure
Flexibility of Closure
Perceptual Speed
Spatial Orientation
Visualization
Selective Attention
Time Sharing

Control
Arm-Hand Steadiness
Manual Dexterity
Finger Dexterity
Control Precision
Multilimb Coordination
Response Orientation
Rate Control
Reaction Time
Wrist-Finger Speed
Speed of Limb Movement

Physical Strength
Static Strength
Explosive Strength
Dynamic Strength
Trunk Strength
Stamina
Extent Flexibility
Dynamic Flexibility
Gross Body Coordination
Gross Body Equilibrium

Sensory
Near Vision
Far Vision
Visual Discrimination
Night Vision
Peripheral Vision
Depth Perception
Glare Sensitivity
Hearing Sensitivity
Auditory Attention
Sound Localization
Speech Recognition

Skills

Basic
Reading Comprehension
Active Listening
Writing
Speaking
Mathematics
Science
Process
Critical Thinking
Active Learning
Learning Strategies
Monitoring

Social
Social Perceptiveness
Coordination
Persuasion
Negotiation
Instructing
Service Orientation

Problem Solving
Problem Identification
Information Gathering
Information Organization
Synthesis/Reorganization
Idea Generation
Idea Evaluation
Implementation Planning
Solution Appraisal

Technical
Operations Analysis
Technology Design
Equipment Selection
Installation
Programming
Testing
Operation Monitoring
Operation and Control
Product Inspection
Equipment Maintenance
Troubleshooting
Repairing

Systems
Visioning
Systems Perception
Identifying Downstream Consequences
Identification of Key Causes
Judgment and Decision Making
Systems Evaluation

Resource Management
Time Management
Management of Financial Resources
Management of Material Resources
Management of Personnel Resources

Appendix C *(continued)*

O*NET Skills Taxonomy

Knowledge

Business and Management
Administration and Management
Clerical
Economics and Accounting
Sales and Marketing
Customer and Personal Service
Personnel and Human Resources

Arts and Humanities
English Language
Foreign Language
Fine Arts
History and Archeology
Philosophy and Theology

Communications
Telecommunications
Communications and Media
Occupational Requirements

Manufacturing and Production
Production and Processing
Food Production

Engineering and Technology
Computers and Electronics
Engineering and Technology
Design
Building and Construction
Mechanical

Health Services
Medicine and Dentistry
Therapy and Counseling

Law and Public Safety
Public Safety and Security
Law, Government and Jurisprudence

Math and Science
Mathematics
Physics
Chemistry
Biology
Psychology
Sociology and Anthropology
Geography

Transportation

Education and Training

Generalized Work Activities

Information Input
Looking for/Receiving Job-Related Information
Getting Information Needed to Do the Job
Monitor Processes, Material, Surroundings
Identify/Evaluating Job-Relevant Information
Identifying Objects, Actions, and Events
Inspecting Equipment, Structures, Material
Estimating Needed Characteristics

Interacting With Others
Communicating/Interacting
Interpreting Meaning of Info. to Others
Communicating With Other Workers
Communicating With Persons Outside Organization
Establishing and Maintaining Relationships
Assisting and Caring for Others
Selling or Influencing Others
Resolving Conflict, Negotiating with Others
Performing for/Working with Public
Coordinating/Developing/Managing/Advising
Coordinating Work and Activities of Others
Developing and Building Teams
Teaching Others
Guiding, Directing and Motivating Subordinates
Coaching and Developing Others
Provide Consultation and Advice to Others
Administering
Performing Administrative Activities
Staffing Organizational Units
Monitoring and Controlling Resources

Mental Processes
Information/Data Processing
Judging Qualities of Things, Services, People
Processing Information
Evaluating Information Against Standards
Analyzing Data or Information
Reasoning/Decision Making
Making Decisions and Solving Problems
Thinking Creatively
Updating and Using Job-Relevant Knowledge
Developing Objectives and Strategies
Scheduling Work and Activities
Organizing, Planning, and Prioritizing

Work Output
Performing Physical and Manual Work Activity
Performing General Physical Activities
Handling and Moving Objects
Controlling Machines and Processes
Operating Vehicles or Equipment
Performing Complex/Technical Activities
Interacting With Computers
Drafting and Specifying Tech. Devices, etc.
Implementing Ideas, Programs, etc.
Repairing and Maintaining Mechanical
Repairing and Maintaining Electrical Equipment
Documenting/Recording Information

Appendix D

Overview of NEOs

All Industries		Employed in 1998	Hired in 1998	Skill Data Available
High Tech	Application Analyst/Engineer	6	3	6
	Application/System User	4	3	4
	Internet Specialist/Technician	49	14	37
	IT Coordinator/Manager	28	4	15
	IT Specialist/Technician	72	17	29
	MIS Administrator/Coordinator	37	7	3
	MIS Specialist	94	33	19
	Network Administrator	94	18	38
	Network Specialist/Technician	55	15	31
	PC Coordinator/Manager	57	15	11
	PC Specialist/Technician	313	135	108
	Programmer/System Analyst	27	6	27
	Subtotal	***836***	***270***	***328***
Management and Administrative	Management and Administrative Assistant/Specialist	8	5	8
	Management and Administrative Coordinator	8	5	8
	Marketing and Sales Assistant/Specialist	4	4	4
	Project Leader/Coordinator/Manager	14	7	14
	Subtotal	***34***	***21***	***34***
Quality Control	Quality Analyst/Auditor	24	7	12
	Quality Coordinator/Supervisor	47	15	19
	Subtotal	***71***	***22***	***31***
Industrial Safety	Safety Director/Coordinator	112	15	29
	Safety Technician	1	1	1
	Subtotal	***113***	***16***	***30***
All Industries Total		**1,054**	**329**	**423**

Industry Specific		Employed in 1998	Hired in 1998	Skill Data Available
Printing and Publishing	Desktop Publishing Specialist/Technician	155	32	26
	Docutech Copy Editor	1	1	0
	Electronic Pre-Press Operator	38	9	3
	Electronic Pre-Press Planner	10	3	8
	Multicolor Press Operator	124	25	10
	Paginator	16	4	6
	Specialized Operators and Technicians	9	9	9
	Thermoforming Specialist	2	2	0
	Total	**353**	**83**	**62**
Health Service	Community Relations Supervisor	8	0	0
	Crisis Team Liaison	3	0	0
	Diabetes Education Coordinator	1	1	1
	Family Nurse Practitioner	15	4	1
	Health Information Manager	1	1	1
	Resident Assessment Coordinator	18	6	12
	Restorative Therapy Coordinator	4	2	0
	Total	**46**	**12**	**15**

Appendix E

NEOs in Minnesota by Industry, Size and Region

Firm Industry	NEOs	No NEOs	Sum	Number Surveyed	Response Rate	Firms in State*
Agriculture	1	57	58	372	15.6%	1,079
Mining	0	2	2	25	8.0%	25
Construction	12	69	81	446	18.2%	4,023
Manufacturing	56	170	226	1,236	18.3%	5,225
Durable	24	70	94	452	20.8%	3,132
Non Durable	10	53	63	413	15.3%	1,159
Printing	22	47	69	371	18.6%	934
TCPU	9	59	68	438	15.5%	2,530
Wholesale Trade	17	73	90	445	20.2%	5,227
Retail Trade	5	75	80	523	15.3%	17,785
FIRE	9	51	60	444	13.5%	4,242
Service	52	184	236	1,406	16.8%	20,192
Business	17	60	77	536	14.4%	3,012
Health	14	55	69	438	15.8%	3,416
All Other Services	22	69	91	432	21.1%	13,764
Government	17	46	63	366	17.2%	1,619
TOTAL	**179**	**786**	**965**	**5,701**	**16.9%**	**61,947**

Firm Size	NEOs	No NEOs	Sum	Number Surveyed	Response Rate	Firms in State*
5 to 24 employees	37	429	466	2,820	16.5%	45,760
25 to 74 employees	38	155	193	889	21.7%	11,129
75 to 249 employees	76	154	230	1,312	17.5%	4,284
250+ employees	28	48	76	680	11.2%	774
TOTAL	**179**	**786**	**965**	**5,701**	**16.9%**	**61,947**

Firm Location	NEOs	No NEOs	Sum	Number Surveyed	Response Rate	Firms in State*
Greater Minnesota	63	271	334	1,906	17.5%	18,773
MSAs	71	290	361	2,246	16.1%	33,975
Minneapolis and St. Paul	45	225	270	1,549	17.4%	9,199
TOTAL	**179**	**786**	**965**	**5,701**	**16.9%**	**61,947**

***** Firms with missing physical address information, out-of-state addresses as well as firms with less than five employees and those surveyed by other researcher projects are excluded. Parent firms were included, while multiple sites were excluded.

Appendix F

High Tech NEO Job Titles and Status

Cluster Subgroup	Job Title	Titles	NEO Status
Application analyst/engineer	Applications development manager	1	Evolving
	Data engineer security engineer	1	Evolving
	Interactive specialist	1	New
	Principal applications analyst	1	New
	Software engineer	1	Evolving
	Y2K software analyst	1	New
Internet specialist/technician	Internet specialist	6	New
	Internet specialist data services representative	1	New
	Internet specialist technician	4	New
	Internet specialist web page designer	1	New
	Internet systems administrator	1	New
	Internet technical specialist	1	New
	Webmaster	1	New
IT coordinator/manager	Advanced services manager	1	Evolving
	Assistant manager for office automation	1	Evolving
	Computer technology administrator	1	Evolving
	Information technology coordinator computer systems	1	Evolving
	Information technology coordinator/manager	1	Evolving
	Information technology director	1	Evolving
	Information technology manager	1	Evolving
	Internet specialist technician	1	Evolving
	Internet systems manager	1	New
	IS manager	2	Evolving
	IT manager	1	Evolving
	Technical information systems manager	1	New
	Technical services manager	1	Evolving
	Technology director	1	Evolving
IT specialist/technician	Information analyst	1	Evolving
	Information systems specialist	1	Evolving
	Information tech specialist	1	Evolving
	Information technology specialist	9	Evolving
	IS technician	1	Evolving
	Technology specialist	2	Evolving
	Technology support specialist	1	Evolving
	Technology support technician	1	Evolving
	Technology technician	1	Evolving
MIS administrator/coordinator	Management information supervisor	1	Evolving
	MIS coordinator	1	Evolving
	MIS director	1	Evolving
	MIS manager	1	Evolving
MIS specialist	Management information specialist	6	New
	MIS assistant	1	New
Network administrator	Controller systems	1	Evolving
	Information systems administrator	1	Evolving
	Information systems coordinator	1	Evolving
	IS manager	1	Evolving
	LAN administrator	2	New
	Network administrator	10	New
	Network manager	1	Evolving
	Network system administrator	15	New
	Network systems administrator	1	New
	PC/network technician	1	Evolving

Appendix F *(continued)*

High Tech NEO Job Titles and Status

Network administrator	Soc (network) coordinator	1	Evolving
	System coordinator	1	Evolving
	Systems administrator	4	Evolving
Network specialist/technician	Data networking specialist	1	New
	Information services technician	1	Evolving
	Network analyst	1	New
	Network system analyst	1	New
	Network systems technician	11	New
	Network technician	1	Evolving
	Network telecommunication specialist	1	Evolving
	Systems analyst	1	Evolving
PC coordinator/manager	Computer coordinator	3	Evolving
	Computer manager	1	Evolving
	Computer manager computer systems manager	1	Evolving
	Computer or PC coordinator manager	2	Evolving
	Computer specialist team leader	1	Evolving
	PC coordinator	2	Evolving
	PC coordinator manager	1	Evolving
PC specialist/technician	Computer or PC specialist	3	Evolving
	Computer or PC specialist technician	2	Evolving
	Computer PC specialist	3	Evolving
	Computer PC specialist or technician	3	Evolving
	Computer PC specialist technician	1	Evolving
	Computer PC technician	1	Evolving
	Computer specialist	5	Evolving
	Computer specialist technician	1	Evolving
	Computer specialist technician technology support	1	Evolving
	Computer supply specialist	1	Evolving
	Computer support	1	Evolving
	Computer support specialist	1	Evolving
	Computer tech	1	Evolving
	Computer technician	3	Evolving
	Computer technician systems manager	1	Evolving
	PC specialist	2	Evolving
	PC specialist technician	3	Evolving
	PC support technician	2	Evolving
	PC technician	1	Evolving
Programmer/system analyst	Computer specialist programmer analyst	1	Evolving
	Computer specialist programmer analyst team leader	1	Evolving
	Data systems director/programmer	1	Evolving
	Pro IV Programmer Analyst	1	Evolving
	Programmer analyst	4	Evolving
	Senior architect	1	Evolving
	Senior programmer/analyst	1	Evolving
	Systems analyst (Oracle)	1	Evolving
	Workstation analyst	1	Evolving
Application/system user	AS/400 coordinator	1	Evolving
	Computer graphics specialist	1	Evolving
	Database administration	1	Evolving
	Data processing	1	Evolving
	Database administrator	1	Evolving
	GIS specialist	1	New
	Information services database administration	1	Evolving

Appendix G

Skill Importance Scores for NEO Clusters (weighted by employment)

Abilities

	Reasoning	Physical	Control	Sensory
Health Service				
Health Services Coordinator	4.4	2.6	4.0	4.9
Health Services Manager/Professional	4.5	3.5	4.5	4.5
High Tech				
Application analyst/engineer	4.0	1.8	2.3	4.0
Application/system user	4.4	2.1	3.1	4.3
Internet specialist/technician	4.4	1.8	2.3	4.0
IT coordinator/manager	4.6	1.8	2.4	4.2
IT specialist/technician	4.3	2.8	3.1	4.2
MIS administrator/coordinator	4.8	2.0	2.0	4.0
MIS specialist	4.9	2.3	2.1	4.4
Network administrator	4.4	2.4	3.0	3.8
Network specialist/technician	4.4	2.6	3.1	3.8
PC coordinator/manager	4.4	2.3	2.8	3.6
PC specialist/technician	4.6	2.3	2.7	4.1
Programmer/system analyst	4.7	2.1	2.2	3.7
Industrial Safety				
Safety coordinator/director	4.2	2.5	2.8	3.9
Safety technician	3.0	3.0	2.0	5.0
Management and Administration				
Management and administrative assistant/specialist	4.3	2.5	3.1	4.0
Management/coordinator	5.0	1.6	1.9	3.6
Marketing and sales assistant/specialist	4.0	1.7	2.2	4.0
Project leader/coordinator/manager	4.9	1.1	1.9	4.4
Printing and Publishing				
Desktop publishing	4.5	1.6	3.4	4.9
Electronic pre-press	4.7	1.7	3.2	4.9
Paginators	4.8	1.7	1.8	4.7
Press operators	4.7	4.9	4.5	4.8
Printing supervisors, operators and technicians	4.7	2.0	2.8	4.3
Quality Control				
Quality analyst/auditor	4.6	2.3	2.5	4.1
Quality coordinator/supervisor	4.6	2.6	3.3	4.4

1 = Not Important 2 = Somewhat Important 3 = Important 4 = Very Important 5 = Extremely Important

Appendix G *(continued)*

Skill Importance Scores for NEO Clusters (weighted by employment)

General Work Activities	Input	Interaction	Process	Output
Health Service				
Health Services Coordinator	4.4	5.0	4.9	4.0
Health Services Manager/Professional	5.0	4.5	5.0	4.0
High Tech				
Application analyst/engineer	3.4	3.1	3.9	2.7
Application/system user	4.6	4.4	5.0	4.6
Internet specialist/technician	4.2	4.2	4.1	3.1
IT coordinator/manager	4.4	4.3	4.4	3.1
IT specialist/technician	4.3	4.4	4.1	3.6
MIS administrator/coordinator	4.5	3.8	4.5	4.0
MIS specialist	4.9	4.6	3.7	3.7
Network administrator	4.1	3.9	4.4	4.0
Network specialist/technician	4.6	4.2	4.5	3.8
PC coordinator/manager	4.3	4.4	4.2	3.7
PC specialist/technician	3.9	3.9	4.5	3.5
Programmer/system analyst	4.8	4.2	4.8	3.8
Industrial Safety				
Safety coordinator/director	4.3	4.5	4.3	2.9
Safety technician	4.0	4.0	3.0	2.0
Management and Administration				
Management and administrative assistant/specialist	4.4	3.9	3.3	2.5
Management/coordinator	4.5	4.9	4.9	2.5
Marketing and sales assistant/specialist	4.2	4.3	3.7	2.5
Project leader/coordinator/manager	4.4	4.3	4.9	2.6
Printing and Publishing				
Desktop publishing	4.4	3.8	4.6	4.3
Electronic pre-press	4.6	3.8	4.7	3.7
Paginators	4.5	4.5	5.0	4.7
Press operators	4.9	4.2	4.7	5.0
Printing supervisors, operators and technicians	4.8	4.2	4.4	4.6
Quality Control				
Quality analyst/auditor	4.4	4.1	4.5	2.5
Quality coordinator/supervisor	4.4	4.4	4.6	3.1

1 = Not Important 2 = Somewhat Important 3 = Important 4 = Very Important 5 = Extremely Important

Appendix G *(continued)*

Skill Importance Scores for NEO Clusters (weighted by employment)

Skills	Problem Solving	Basic	Resource	Social	Technical	System
Health Service						
Health Services Coordinator	4.3	4.9	4.8	5.0	3.1	2.9
Health Services Manager/Professional	4.5	4.5	4.5	4.5	3.0	4.0
High Tech						
Application analyst/engineer	3.9	4.0	3.7	3.1	3.8	3.8
Application/system user	4.3	4.1	3.4	3.6	4.4	3.9
Internet specialist/technician	4.1	4.5	3.8	3.5	3.9	4.0
IT coordinator/manager	4.4	4.1	4.3	4.2	4.4	4.2
IT specialist/technician	4.4	3.8	3.9	4.4	4.6	3.6
MIS administrator/coordinator	4.8	4.0	4.5	4.0	4.5	3.5
MIS specialist	4.4	4.1	2.9	4.2	4.1	4.1
Network administrator	4.3	4.1	3.9	4.0	4.3	4.0
Network specialist/technician	4.7	4.0	3.7	3.8	4.6	4.5
PC coordinator/manager	4.3	4.3	4.0	4.5	3.8	3.8
PC specialist/technician	4.4	4.3	3.3	3.7	3.5	3.3
Programmer/system analyst	4.8	4.3	3.4	4.2	4.2	3.8
Industrial Safety						
Safety coordinator/director	4.1	3.8	3.8	4.5	2.5	3.2
Safety technician	2.0	3.0	2.0	4.0	2.0	2.0
Management and Administration						
Management and administrative assistant/specialist	3.9	4.0	3.4	3.8	2.5	2.8
Management/coordinator	4.4	4.3	4.3	4.6	2.3	3.0
Marketing and sales assistant/specialist	3.3	3.7	3.3	4.0	2.3	2.5
Project leader/coordinator/manager	4.8	4.8	3.3	4.9	3.0	3.3
Printing and Publishing						
Desktop publishing	4.4	4.5	4.1	4.3	4.5	3.0
Electronic pre-press	4.1	4.8	3.3	4.1	4.4	2.0
Paginators	5.0	4.3	3.8	4.3	4.8	3.0
Press operators	4.3	4.7	5.0	5.0	4.9	3.7
Printing supervisors, operators and technicians	3.8	3.8	4.3	4.7	4.6	3.9
Quality Control						
Quality analyst/auditor	4.4	4.6	4.2	4.2	3.1	3.9
Quality coordinator/supervisor	4.1	4.3	4.0	4.5	3.2	3.3

1 = Not Important 2 = Somewhat Important 3 = Important 4 = Very Important 5 = Extremely Important

Appendix G *(continued)*

Skill Importance Scores for NEO Clusters (weighted by employment)

Knowledge	Business	Arts	Comm-unication	Education	Tech-nology	Health	Law and Safety	Production	Math and Science	Trans-portation
Health Service										
Health Services Coordinator	2.9	3.1	3.9	2.6	2.3	4.2	2.6	1.2	3.4	1.4
Health Services Manager/Professional	2.5	3.0	4.5	3.0	2.0	4.5	3.0	2.5	3.0	2.0
High Tech										
Application analyst/engineer	2.2	2.3	2.9	2.1	3.7	1.3	1.2	1.8	2.8	1.3
Application/system user	2.4	2.3	3.7	3.3	4.3	1.6	1.7	2.0	3.3	1.6
Internet specialist/technician	2.8	2.8	3.9	3.0	4.5	1.1	1.6	1.0	2.5	1.1
IT coordinator/manager	3.6	2.6	3.9	3.0	4.1	1.4	1.9	1.6	2.4	1.1
IT specialist/technician	2.5	2.0	3.5	3.1	4.0	1.5	2.2	1.6	2.5	1.5
MIS administrator/coordinator	3.3	2.5	3.5	3.5	4.0	1.5	2.0	1.5	2.8	1.5
MIS specialist	3.3	2.9	3.7	3.8	4.8	1.0	1.8	1.4	4.0	1.2
Network administrator	2.9	2.1	3.7	3.2	3.8	1.2	1.8	2.0	2.9	1.2
Network specialist/technician	2.4	2.0	3.7	2.3	4.1	1.3	1.5	1.3	2.8	1.3
PC coordinator/manager	3.1	2.3	4.1	3.8	4.0	1.3	2.3	1.8	3.2	1.7
PC specialist/technician	2.4	1.8	3.3	2.3	3.8	1.3	1.8	1.7	2.8	1.3
Programmer/system analyst	3.1	2.0	3.8	3.5	4.9	1.5	2.2	1.5	3.3	1.6
Industrial Safety										
Safety coordinator/director	2.7	2.7	3.5	3.8	2.5	3.1	4.2	2.8	2.5	2.1
Safety technician	4.0	1.0	3.0	4.0	2.0	1.0	1.0	1.0	2.0	1.0
Management and Administration										
Management and administrative assistant/specialist	2.6	3.0	3.5	3.1	2.6	1.6	2.0	1.6	2.4	0.9
Management/coordinator	3.5	2.8	4.3	3.3	2.1	2.5	2.6	2.5	2.6	1.6
Marketing and sales assistant/specialist	2.5	2.2	3.5	2.2	2.7	1.0	1.2	1.8	1.7	2.0
Project leader/coordinator/manager	3.3	2.3	4.4	1.8	2.6	1.0	1.8	1.6	2.4	2.7
Printing and Publishing										
Desktop publishing	1.4	2.2	3.4	1.7	3.4	1.0	1.6	1.8	2.8	1.1
Electronic pre-press	1.8	2.2	4.2	1.5	3.6	1.0	2.2	1.5	2.8	1.0
Paginators	1.7	3.2	4.3	3.0	3.3	1.2	1.8	3.2	3.5	1.0
Press operators	1.5	2.1	3.3	1.7	2.3	1.0	1.5	2.8	2.7	1.0
Printing supervisors, operators and technicians	1.9	2.1	4.2	3.2	2.4	1.2	1.7	2.8	1.7	1.0
Quality Control										
Quality analyst/auditor	3.1	2.9	3.9	3.8	3.4	2.0	2.4	3.3	3.7	2.1
Quality coordinator/supervisor	2.9	2.7	3.9	3.7	3.3	2.4	3.2	2.7	3.8	1.7

1 = Not Important 2 = Somewhat Important 3 = Important 4 = Very Important 5 = Extremely Important

Appendix H

Survey Instrument

Section One: Identifying New and Evolving Occupations

In 1997, the Minnesota Department of Economic Security identified the following new and evolving occupations which were common across all industries. On the following page (Page 2), additional space is provided for you to add additional job titles that are not listed below. Please give the exact payroll title. Also indicate the number of individuals who were hired in 1998 and who are currently employed in these positions in your company. If this job does not exist at your company place a **zero** in the "number employed" column.

Printing & Publishing

Job Title	Number Employed	Number Hired in 1998
Desktop Publishing Specialist/Technician *Maintain and produce print documents for distribution.*	_____	_____
Docutech Copy Editor *Operate docutech machine to reproduce text, graphics or similar materials.*	_____	_____
Electronic Pre-press Operator *Pre-test production reliability, correct problems and route print product film.*	_____	_____
Electronic Pre-press Planner *Plans and maintains schedules for pre-press operations.*	_____	_____
Multicolor Press Operator *Operate and monitor two-color plus press to reproduce text, graphics or similar materials.*	_____	_____
Paginator *Repositions print product pages to press specifications.*	_____	_____
Thermoforming Specialist *Monitors thermoforming press operations to ensure product image quality.*	_____	_____

Health Services

Job Title	Number Employed	Number Hired in 1998
Community Relations Supervisor *Oversee staff who promote communication between the company and community.*	_____	_____
Crisis Team Liaison *Connect emergency and medical services to individuals in need.*	_____	_____
Family Nurse Practitioner *Administer medical care, under the direction of a physician, to families.*	_____	_____
Resident Assessment Coordinator *Oversee staff who evaluate resident/patient health.*	_____	_____
Restorative Therapy Coordinator *Oversee staff of therapists who provide therapy to injured and disable individuals.*	_____	_____

All Industries

Job Title	Number Employed	Number Hired in 1998
Computer or PC Specialist/Technician *Install, support and maintain computer hardware and/or software.*	_____	_____
Computer or PC Coordinator/Manager *Oversee a staff of computer specialists/technicians.*	_____	_____
Information Technology Specialist *Provide computer and electronic equipment support for company.*	_____	_____
Information Technology Coordinator/Manager *Oversee a staff of information technology specialists.*	_____	_____
Internet Specialist/Technician *Maintain and develop World Wide Web servers and web pages.*	_____	_____
Management Information Specialist *Collect and analyze organizational data in a company.*	_____	_____
Management Information Administrator/Coordinator *Oversee a staff of management information specialists.*	_____	_____
Network/Systems Technician *Repair and update a company's networked computer system.*	_____	_____
Network/Systems Administrator *Monitor the networked computer system in a company.*	_____	_____
Quality Auditor *Examine and analyze quality programs in a company.*	_____	_____
Quality Coordinator/Supervisor *Develop and oversee quality control programs in a company.*	_____	_____
Safety Director/Coordinator	_____	_____

Additional New and Evolving Job Titles at Your Company

*Please use the additional comments space on the last page of this survey if you need more room.

Job Title	Number Employed	Number Hired in 1998
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____

After completing this section, go to **Section Two.**

Section Two: Identifying 1998 New and Evolving Occupations

Please list three job titles from Section One that best capture the rapidly changing skill requirements in your company over the ***past five years***. These can include the titles that we listed or the ones you provided. The remainder of this survey will focus on these three jobs. If the payroll title is new to your company, mark the checkbox with the heading **NEW**.

Job Titles (from Section One) **NEW**

Job Title A _____

Job Title B _____

Job Title C _____

Important Note: If you **did not** list any job titles **or** identify any new and evolving occupations listed on page 1, please place the partially completed survey in the postage paid envelope and return it promptly. **Your response is very important!** Thank you.

1. In order to help us understand the specific duties of these jobs, please include a brief job description for each position in the space below. **If job descriptions for these positions already exist please attach them to this page and go to question 2.**

Job A_____

_____

_____

_____

_____

Job B _____

_____

_____

_____

_____

Job C _____

_____

_____

_____

_____

2. For each job title, please complete the following information:

	Job A	**Job B**	**Job C**
Average Hourly Wage	_____	_____	_____
Average Hours Worked per Week	_____	_____	_____
Number Currently Employed in Position	_____	_____	_____
Number Hired Within Past Year	_____	_____	_____
Number of Vacancies for Position	_____	_____	_____

3. If you were hiring someone to fill this position today, what is the ***minimum*** education or training level you would require? (*please check only one for each job title*)

	Job A	**Job B**	**Job C**
Professional Degree (e.g., MD)			
Ph.D.			
Master's Degree			
Work Experience, plus a Bachelor's degree			
Bachelor's Degree			
Associate Degree			
Vocational Training			
H.S. Diploma/GED **plus** Work Experience			
H.S. Diploma/GED **plus** more than 12 months on-the-job training			
H.S. Diploma/GED **plus** 1 to 12 months of combined on-the-job experience and informal training			
H.S. Diploma/GED **plus** up to 1 month on the job-experience			
High School Diploma/GED			
Other (*please specify*) _____			

4. Please rate the jobs you identified above as to the ease of filling them with ***qualified job applicants*** by checking the appropriate box:

	Very Easy	**Easy**	**Average**	**Difficult**	**Very Difficult**
Job A					
Job B					
Job C					

5. Do you require your employees to have a license, certificate or registration (other than a driver's license or vehicle operator's license) to perform this job? (*please circle appropriate response*)

Job A Yes No If YES, what type: _____

Job B Yes No If YES, what type: _____

Job C Yes No If YES, what type: _____

6. Please indicate how important, on a scale of 1 to 5 (with 1 meaning "not important" and 5 meaning "extremely important"), the following factors were for prompting the creation of these new and evolving jobs in your company.

	Job A	**Job B**	**Job C**
Technological Advances	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Legal Requirements	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Customer Needs	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Increased Competition	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Changes in Workplace Organization	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Section Three: Worker Skill Sets

For each of the titles you have identified in Section Two, please indicate how important the following skills are for a worker to adequately perform each job. Using the skill definitions provided below, circle the appropriate number for each skill category using the following scale of values (1 to 5). In doing so, ask yourself the following question, **"How important is this skill, knowledge or ability to job performance?"**

1 = Not Important	2 = Somewhat Important	3 = Important	4 = Very Important	5 = Extremely Important

ABILITIES	JOB A	JOB B	JOB C
REASONING ABILITIES *The ability to acquire and apply knowledge in problem solving.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
PHYSICAL ABILITIES *Using strength, endurance, flexibility, balance and coordination to complete tasks.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
PSYCHOMOTOR ABILITIES *The ability to handle and control objects in the workplace.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
SENSORY ABILITIES *Using the ability to see, hear and talk to complete job tasks.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

GENERAL WORK ACTIVITIES	JOB A	JOB B	JOB C
INFORMATION INPUT *Finding where and how to gain information and data to perform the job.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
INTERACTING WITH OTHERS *Interacting with other persons or supervising activities.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
MENTAL PROCESSES *Requires processing, planning, problem solving, and decision making.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
WORK OUTPUT *Requires performing physical activities, operating/controlling equipment, and performing complex/technical activities.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

SKILLS	JOB A	JOB B	JOB C
PROBLEM SOLVING SKILLS *The capacity to solve ill-defined problems in complex, real-world settings.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
BASIC SKILLS *Completing tasks using basic skills, such as reading, math and science.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
RESOURCE MANAGEMENT SKILLS *The efficient allocation of time, financial, material and/or human resources.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Section Three continued.

Using the skill definitions provided below, circle the appropriate number for each skill category using the following scale of values (1 to 5). In doing so, ask yourself the following question, **"How important is this skill, knowledge or ability to the performance of this job?"**

1 = Not Important	2 = Somewhat Important	3 = Important	4 = Very Important	5 = Extremely Important

SKILLS *(continued)*	**JOB A**	**JOB B**	**JOB C**
SOCIAL SKILLS *The ability and willingness to work with others to achieve goals.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
TECHNICAL SKILLS *The ability to design, set-up, operate and repair machinery and technological applications.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
SYSTEMS SKILLS *The ability to improve social arrangements and technical systems in the workplace.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
KNOWLEDGE	**JOB A**	**JOB B**	**JOB C**
BUSINESS & MANAGEMENT *Knowledge of principles and facts related to business administration and management, accounting, economics, sales and marketing.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ARTS & HUMANITIES *Knowledge of the branches of learning concerned with human thought, language and arts.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
COMMUNICATION *Knowledge of the science and art of delivering information.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
EDUCATION & TRAINING *Knowledge of instructional methods, teaching techniques, test design and individual development.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ENGINEERING & TECHNOLOGY *Job requires knowledge of the design, development and application of technology for specific purposes.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
HEALTH SERVICES *Knowledge of diagnosing, curing, and preventing disease, and improving physical and mental health.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
LAW & PUBLIC SAFETY *Knowledge of keeping people and property free from danger, harm or injury.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
MANUFACTURING/PRODUCTION *Knowledge of principles and facts related to the production, processing, storage, and distribution of manufactured and agricultural goods.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
MATH & SCIENCE *Knowledge of the principles and facts related to mathematical, physical, biological and social sciences.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
TRANSPORTATION *Knowledge of the methods for moving people or goods by air, sea or road, including their relative costs, advantages and limitations.*	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5