

South Central Iowa Area Partnership Regional Skillshed Analysis Technical Report

Overview of Skillshed Analysis

The Skillshed brought together and analyzed information from three different sources; the South Central Iowa Area Partnership Laborshed Survey, the Regional Workforce Needs Assessment (Job Vacancy) Survey, and information from the Occupational Information Network (O*NET). These three sources were used to present the supply and demand for labor within the region and the skills required to perform the occupations critical to the region's economy.

The Laborshed survey was designed by the Institute for Decision Making (IDM) and conducted by NCS Pearson. More than 1,900 responses were collected by phone from a random sample of 18-64 year olds within the Clark, Decatur, Lucas, Madison, Wayne, and Union county Laborsheds. Respondents were asked a wide range of demographic and employment related questions. From the survey, we will use the self-reported occupations of the respondents, place of residence, and information on commuting patterns.

Iowa Workforce Development conducted the second annual Workforce Needs Assessment Survey from September 2008 through January 2009. In addition to vacancy and retirement data, this year's survey included questions pertaining to average hourly starting wage. Analysis of the survey illustrates the demand for workers and skills required in the workforce. This information can be used by economic developers, government leaders, educators, and state agencies to guide their decision making on issues related to workforce development, vocational training, and employee recruitment programs.

The Occupational Information Network (O*NET) is a joint effort between the US Department of Labor and the North Carolina Employment Security Commission. It provides a database of standardized and occupation-specific descriptions that help determine which factors are critical in the performance of an occupation.

A Skillshed is the geographic area from which a region pulls its workforce and the skills, education, and experience that the workforce possesses. Traditionally, labor markets have been studied in terms of the products produced by a region to understand what industries are relatively strong. A Skillshed helps to understand not only where the region's competitive strengths currently lie, by understanding the current workforce mix, but also in which occupations or industries could the region grow into by understanding the difference between the current skill set and that skill set needed by emerging markets.

The current skill set of the region was measured by translating the current jobs held by the workforce into a set of knowledge levels and work activities. Location quotients were also performed by occupational category to understand the current strengths of the region. By clustering the skill set of the current workforce, we found the emerging occupational categories that were statistically closest in skills and education. It is into these categories that the region will be able to transition most effectively and efficiently.

The need for a Skillshed lies in the ability to match the current skills of the workforce with the skills needed in high-growth, high-pay jobs and to do so in the most efficient way possible. This is possible because the Skillshed matches the skills of the current workforce with the closest cluster of emerging occupations. In this way, a region can prepare for future occupational

needs but do so spending the least amount of resources and placing fewer educational demands on its workforce.

Methodology for Analysis

Available Secondary Data

Both the Laborshed Survey and Workforce Needs Assessment are available through Iowa Workforce Development. The Occupational Information Network is available online and can be downloaded into a Microsoft Access database as well. All quantitative data and formulas are available in Microsoft Excel format.

Survey Research and Method

The Skillshed primarily relied on three data sources to provide the main data points for the analysis. These were the Iowa Workforce Development Laborshed survey, the IWD Workforce Needs Assessment survey, and the Occupational Information Network (O*NET).

The Laborshed survey was designed by the Institute for Decision Making (IDM) at the University of Northern Iowa and conducted by Adtrack. A Laborshed is defined as the area or region from which an employment center draws its commuting workers. The statewide analysis is composed of 6,000 responses from individuals in the State of Iowa. These responses were extracted from the Statewide Laborshed database of 35,100 surveys conducted between January 2008 and December 2008. Surveys were conducted in each zip code based on a random sample of the population between 18 and 64 years of age and weighted by the total number of people in each zip code. Respondents were asked a wide range of demographic and employment related questions. From the survey, we used the self-reported occupations, prior occupations held, educational background, and home zip codes of respondents. The purpose of Laborshed analysis is to measure the availability and characteristics of workers within the state on geographic principles. The purpose used here was to use the Laborshed data as a proxy for the skills and geographical distribution of the current workforce. Regionally, 1,911 responses were collected from the South Central Iowa Area Partnership Region.

The IWD Workforce Needs survey was conducted from August 2008 to April 2009. All firms in the South Central Iowa Area Partnership region with more than five employees were invited to take the online survey. The survey consisted of questions about current and projected vacancies, employee retirement, benefits offered, and wage data. More than 8,000 firms from the population of 40,000 took part in the statewide survey, with 116 responses from the South Central Iowa Area Partnership. The goal of the survey was to assess the current and near-term hiring demand by industry and occupation throughout Iowa, and help to assess employers' perceptions of workforce skills and the effectiveness of advertising media. For the Skillshed analysis, we analyzed the percentage of vacant positions within each occupation relative to total employment to find the current hiring demand within each occupation. This data helped us to narrow the field of possible occupations and occupational clusters from which to target our recommendations.

The third data source used was the Occupational Information Network (O*NET). O*NET is an interactive application for exploring and searching occupational information. It was developed

by the North Carolina Employment Security Commission in partnership with the US Department of Labor and the Employment and Training Administration. Through a continuing worker survey, O*NET develops and updates its database of the knowledge, work activities, abilities, and distinguishing characteristics of each occupation. O*NET provides a directory of the work activities and knowledge areas needed for each occupation on a scale of one to seven and the importance of each work activity or knowledge area on a scale of one to five. Level one work activities or knowledge are the most basic and encompass such tasks as simple addition and repetition. Some level of training or education becomes necessary by level four, while level seven requires intense inferential thinking and usually post-graduate education. A list of level anchors and a corresponding estimate of the education or experience necessary is attached in Appendix A.

Though O*NET scales occupations across nine variables such as: abilities, skills, values, etc. we focused on two for the Skillshed study, knowledge areas and work activities required for each occupation. The knowledge variable encompassed 33 areas of knowledge such as: Administration and Management, Chemistry, Biology, Medical, Transportation, and Mathematics. These variables are closely related to the educational field in which one has studied. The work activity variable encompassed 41 activities such as: thinking creatively, working with others, interacting with computers, and repairing electronic equipment. These variables are more closely related to the skills one possesses and the experience they have gained from prior work. A full list of knowledge variables and work activities is provided in Appendix B.

We compared the South Central Iowa Area Partnership Regional and Statewide 2007 and 2008 Laborsheds by occupation to study regional trends and occupational concentration. The data showed the percentage of total employment for each year and change in employment. Though the data provided some information at the occupational level, we aggregated the population to the occupational category level as defined by the Bureau of Labor Statistics (BLS). With this we were able to compute location quotients for 2007 and 2008.

From our analysis, further attention would be given to those occupational categories with a 2008 location quotient of 1.1 or higher, meaning the relative concentration of employment in that occupational field is at least 10 percent greater than it is statewide, pointing to possible regionally-specific advantages that favor growth in the category. The complete analysis is provided in Appendix C.

The Purdue Center for Regional Development developed the framework for the Occupational Clusters that was used in the study. The Purdue team used the five job zone categories developed by O*NET to distinguish occupations that require a higher level of education and experience. Zones one and two, the occupations requiring the least amount of preparation, were placed into two separate clusters. All other occupations were aggregated using Ward's hierarchical method to cluster like variables into 15 clusters by similar job tasks and responsibilities. The purpose of targeting these jobs is to show those occupations that rely more heavily on intellectual activity and skill, and presumably contribute to a faster pace of

technical and economic advancement. Bureau of Labor Statistics growth projections to the year 2016 and median wage estimates were added to each occupation to help target those occupations and clusters with the greatest growth and income potential.

The 15 knowledge clusters along with the BLS projected employment and median wages is shown in Appendix D. The percentage of vacancies within each occupation relative to total vacancies, from the Workforce Needs Survey, was also added to the data to measure current hiring demand. The clusters were then analyzed to find those with high overall projected growth, current demand, and an above average median wage. These findings could then be used with regional occupational trend analysis and competitive structure to select the occupational clusters which would be used in gap analysis with the current skill set of the population.

The study, and subsequent recommendations, has focused on broader occupational groupings rather than on the individual occupations themselves. For Laborshed and Workforce Needs analysis, this was done to increase the sample size within each group and thus increase the validity of the data. The 2008 South Central Iowa Area Partnership Laborshed had 1911 respondents, but each occupation may only have been represented by a few respondents. The number of respondents in each occupation averaged approximately one half of a percent of the total employment, or about eight respondents. At the categorical level, however, there was an average of 80 respondents or 4.32 percent of the total employment which meant that the difference of a few respondents would not dramatically skew the outcome. While it may be more efficient to concentrate resources toward a single occupation or a small group of occupations, the study decided to examine the Skillshed at the occupational cluster level. Because of the methodology used to group the occupations into clusters, the occupations within each cluster are similar in terms of skills needed and tasks performed. By focusing on the training and educational needs of the cluster as a whole, the region can help nurture economic development in the area but allow market forces and worker preference to decide the precise occupational mix.

Three emerging occupational clusters most closely matched the current skill set and education of the workforce. It is into these occupations that the workforce would be able to transition with the least amount of training and resources. These occupational clusters were: Information Technology, Agricultural Business & Food Technology, and Healthcare. The three occupational clusters analyzed, comprised of 88 occupations, were then translated into skill sets required to perform each occupation as defined by the O*NET knowledge and work activity measures. A minimum, average, and maximum level for each knowledge and work activity variable was calculated for each cluster. From the importance estimate for each knowledge or work activity variable, we were able to compile a list of critical skill areas needed within each cluster. An importance estimate of 3.25 or higher for a knowledge variable or a 3.75 or higher for a work activity variable was necessary to designate that variable as critical to the cluster. The three occupational clusters are described more thoroughly in the findings section.

These critical variables across each cluster were then examined to find which variables were distinct to each cluster and which were shared. The Information cluster had four critical variables that were also unique to the cluster: knowledge in Computers & Electronics, Engineering & Technology, and Telecommunications and in the work activity of Interacting with Computers. The Agricultural Business & Food Technology cluster had two critical and unique variables: knowledge in Biology and in the work activity of Monitor Processes, Materials, or Surroundings. The Healthcare cluster had five critical variables exclusive to the cluster in the knowledge areas of Medicine & Dentistry, Psychology, and Therapy & Counseling and in the work activities of Assisting & Caring for Others and Establishing & Maintaining Interpersonal Relationships. There were six critical variables shared by all three of the knowledge clusters: knowledge in Customer Service and English Language, and within the work activities of Communicating within the Organization, Getting Information, Making Decisions, and Updating Relevant Knowledge. A comparison of the variables critical to the three occupational groups reveals the similarity across the occupations. Though there are unique knowledge areas and work activities in each group, there is also a great deal of overlap in the skills needed to perform the occupations within the groups. This has important implications for training and education to meet employer needs. While the workforce will need training and education specific to their desired occupation, they can also benefit from a generalized training in the shared areas of skills and education. Any training the population would receive in the shared areas of education or work activities would help to develop the labor pool's ability to perform any of the three targeted occupational clusters.

Using the skills needed in the 33 knowledge areas and the 41 work activities for each occupation as defined by O*NET, each Laborshed respondent was translated into their appropriate skill set depending on their current and previous occupation, and their field of education. This gave us three possible skill sets for each person in the survey sample depending on their occupational history and education. For example: for the knowledge variable Medicine and Dentistry a person may have a knowledge level of 4.52 from their current job as a nurse, a level of 2.44 from a previous career as a Home Health Aide, or a level of 2.0 from their education in general business administration. These three sets were then aggregated into one skill set per person by taking the highest level from each variable by assuming that skill levels are fairly enduring once achieved. Of the 1,911 Laborshed responses, 316 were excluded due to data deficiencies and outliers. This left 1,595 people to be clustered into one of the three emerging occupational groups. Two clustering techniques were considered to aggregate the population for best fit. By clustering the current population into groups, we can better see in which knowledge areas and work activities the population has a relatively high skill level. A minimum, average, and maximum skill level profile was then computed for each population cluster, and the relative strengths across the knowledge and work activity variables were analyzed to find best fit with one of the three targeted occupational clusters.

Gap analysis was performed by comparing the population clusters with their respective occupational cluster. First we analyzed the current skill set of the workforce. The K means clustering technique clustered the population according to where they best fit in one of the three

occupational clusters: Information Technology, Agricultural Business & Food Technology, and Healthcare. The complete analysis is provided in Appendix E.

An interesting point seen from the data is the difference between the skill set of the population as a whole and the skill set when the population is clustered according to their strongest attributes. If we simply consider the population as one group and compute the average skill level of the variables critical to our target knowledge clusters, we find that the group has an average skill level of 2.52. However, when we cluster the population into groups according to their strength in critical variables important to one of the three target knowledge clusters, and then measure average skill levels for the variables critical only to that knowledge cluster, we find that the average skill level increases to 3.42. This means that, by strategically targeting those clustered portions of the population for knowledge cluster specific training, the region can significantly improve its probability of success in achieving a workforce that meets the skills needs for knowledge cluster occupations.

Another interesting point from the data is that, when the clustered population's average skill level is further separated into their average skill level in knowledge-related variables and work activity-related variables, the population consistently shows a higher skill level in the work activity variables. From the occupational clusters an inventory of necessary education and experience was created based on the level of knowledge and work activity needed in the critical areas. This helped us to understand the basic requirements throughout the clusters. The minimum and average skill levels in the critical skill areas were compared to those levels necessary for the occupational cluster. This provided the gap between the average skill level of the clustered population to that of the average skill level needed for the occupational clusters. Knowing these gaps and in which knowledge or work activity variables they exist helps us to estimate education or training needed. Formal education required to move from level to level was estimated with the level anchors provided by O*NET.

Findings

The final selection of target occupational clusters was based on three points: (1) current workforce needs as measured by percentage of vacancies within the cluster relative to total vacancies, (2) BLS employment growth projections and median wages, and (3) the Laborshed trend analysis. By basing the selection on these three criteria, it is hoped that economic or educational responses to the study will satisfy some fundamental ideas. One, by promoting training and education in occupations that are currently in high demand, the region can help move the markets for these occupations closer toward equilibrium, reducing employment search costs for businesses and potentially consumer costs for the products or services. Two, Laborshed trend analysis helps us to discover the path of least resistance for the region. These occupational categories are already relatively more concentrated or growing at a faster pace than elsewhere and have the benefit of momentum and competitive advantage. It is more likely that resources spent in these groups can have a larger effect and can be more quickly implemented. Finally, by narrowing the field to those occupational categories with higher than average growth and median wages we help to ensure that more economic value will be added to the region.

The trend analysis showed the region’s relative employment concentration in: Community and Social Services; Education, Training, and Library; Computer & Mathematical; Personal Care and Services; Management; Business & Financial Operations; and Healthcare Support. Further, each of these occupational groups experienced an increase in concentration from 2007 to 2008. This means that, not only does the region employ a larger number of these workers relative to the statewide average, the region is continuing to hire workers in these groups.

After regional trend analysis, clusters with an above average overall growth projection of more than 11 percent and an average median wage above \$45,000 were selected for further criteria. After analyzing the clusters according to the projected growth, median wage, and vacancy rate criteria the clusters with the most potential were Information Technology, Agricultural Business & Food Technology, and Healthcare.

Twenty variables were found to be critical to the occupations within the occupational clusters of the emerging occupations. By focusing on these critical knowledge areas and skills, we can see what subgroups within the current workforce are well-suited to transition to the occupations that will drive the 21st century economy and better spend resources on the education and skills needed to help the workforce make the transition.

Table 1. Knowledge Areas and Work Activities critical to Information Technology, Healthcare, and Agricultural Business & Food Technology.

Critical Work Activities	Critical Knowledge Areas
Assisting & Caring for Others	Biology
Communication with Supervisors, Peers, or Subordinates	Computers & Electronics
Documenting & Recording Information	Customer Service
Establishing & Maintaining Interpersonal Relationships	Engineering & Technology
Getting Information	English Language
Identifying Objects, Actions, or Events	Mathematics
Interacting with Computers	Medicine & Dentistry
Making Decisions & Problem Solving	Psychology
Monitor Processes, Materials, or Surroundings	Telecommunications
Updating & Using Relevant Information	Therapy & Counseling

Occupational Category Overview: Agricultural Business & Food Technology

Agricultural business & food technology is an expanding field in today’s economy that includes both positions and practices that have been around for decades, as well as fast-developing, technology-driven positions and practices that are relatively new to the industry. The industry is using today’s technology to make existing processes more efficient and to create and explore entirely new products and directions for the field. The job market of the agricultural business & food technology industry has a promising future as farm mechanization, food processing, organic farming, and other green farming and processing practices continue to expand and gain importance.

Many of the workers employed in the agricultural business industry hold positions directly related to the planting and harvesting of crops, as well as the raising of livestock. And while many of these positions have existed for decades, today they are leaning increasingly heavily upon technological innovations in the manufacturing and operating of machinery and implements produced and used by the industry. These innovations play an important role in all phases, and therefore all positions, of the industry, from soil preparation and planting to harvesting and post-harvest processing. Similarly, the food technology field continues to grow as retailers and consumers alike become more aware of, and demanding in, their choices in food processing and preservation. Here again, technology and the green movement are rapidly changing the way the industry approaches the processing, preservation, packaging, and distribution of safe, nutritious, and convenient foods. The focus on agricultural processes and technologies that is shared by nearly all of the positions in the agricultural business & food technology industry makes it relatively easy for individuals within the industry to change positions. However, as with any industry driven by technology, the need for regular training and continuing education of workers is prevalent.

The Bureau of Labor Statistics' (BLS) Standard Occupational Classification (SOC) system identifies numerous job titles that fall within the Ag Business & Food Tech category. For our purposes, the job titles (and corresponding SOC codes) that we will be including in our analysis of the group are as follows: purchasing agents and buyers of farm products (131021), farmers and ranchers (119012), agricultural inspectors (452011), animal breeders (452021), chemical technicians (194031), agricultural and food science technicians (194011), food scientists and technologists (191012), water and liquid waste treatment plant and system operators (518031), pesticide handlers and applicators (373012), biological technicians (194021), and veterinarians (291131). These particular job titles were chosen based upon their combination of relatively high projected employment growth, median salaries, and current vacancy needs.

Using survey data received from employers, we were able to determine which Knowledge Areas and Work Activities would be most beneficial to applicants looking for work in the Agricultural Business & Food Technology occupational category. According to the data for this group and these positions, it is most beneficial for applicants to have knowledge in Biology, Customer Service, English, and Mathematics. Also, it is beneficial for applicants to have work experience in Communication inside an Organization; Documenting & Recording Information; Getting Information; Identifying Objects, Actions, or Events; Making Decisions & Problem Solving; Monitoring Processes, Materials, or Surroundings; and Updating & Using Relevant Information.

Industry Overview: Health Care

The health care field is undeniably one of the most important industries in the country. Whether it is directly assisting individual patients and their families, or working in clinical laboratories, or specializing in the organization and retention of medical records, workers in the health care industry provide goods and services that benefit nearly everyone at some time or another. As medical knowledge and techniques progress allowing Americans to live longer, and as a large percentage of the nation's population reaches an advanced age, it is no surprise that jobs within

the health care industry have been steadily increasing in numbers and are projected to continue doing so in the future.

As indicated above, the positions available within the health care industry are widely varied in their focus and responsibilities. While most people think of health care positions that feature a heavy focus on customer service due to their amount of direct contact with patients and families, there are also many positions with an acute focus on science and technology, such as lab technicians and medical researcher positions. This broad range of opportunities predictably attracts a similarly broad range of applicants to the industry. Once employed within the industry; however, workers are often able to change positions relatively easily, due to many jobs within the industry sharing a good deal of education, skills, and training. This is not to say; however, that health care workers will not need additional education and/or training to progress within the industry. Quite the opposite, in fact, as the field is constantly changing with new research findings and technologies.

The Bureau of Labor Statistics' (BLS) Standard Occupational Classification (SOC) system identifies numerous job titles that fall within the health care industry. For our purposes, the job titles (and corresponding SOC codes) that we will be including in our analysis of the health care industry are as follows: Physician Assistants (291071) under the subheading Health Care and Medical Science (Medical Practitioners and Scientists); Radiation Therapists (291124), Cardiovascular Technologists and Technicians (292031), and Dental Hygienists (292021) under the subheading Health Care and Medical Science (Medical Technicians); Registered Nurses (291111), and Physical Therapists (291123) under the subheading Health Care and Medical Science (Therapy, Counseling, Nursing, and Rehabilitation). These particular job titles were chosen based upon their combination of relatively high projected employment growth, median salaries, and current vacancy needs.

Using survey data received from employers, we were able to determine which Knowledge Areas and Work Activities would be most beneficial to applicants looking for work in the healthcare industry. According to the data for this industry and these positions, it is most beneficial for applicants to have knowledge in Customer and Personal Service, English Language, Medicine and Dentistry, Psychology, and Therapy and Counseling. Also, it is beneficial for applicants to have work experience in Assisting and Caring for Others; Communication with Supervisors, Peers, or Subordinates; Documenting/Recording Information; Establishing and Maintaining Interpersonal Relationships; Getting Information; Making Decisions and Solving Problems; and Updating and Using Relevant Knowledge.

Industry Overview: Information Technology

Information technology (IT) is one of the fastest-developing and most important industries in America today. In fact, the IT field has quickly become so versatile and so vital to every other industry within our economy that it can be difficult to think of it as an industry in its own right. Just look around and one can see how much our economy (and our society, in general) relies on technology every day. And while nearly every industry includes a number of positions that focus solely on information technology, even those that do not (and those positions that do not) almost certainly require the use of computers and technology to accomplish tasks and process

information. This universal reliance upon technology, as well as the field's ever-evolving nature, ensure that the IT industry will be a growing source of jobs for the economy for years to come.

An industry that is largely characterized by constant change and by its support of every other industry will inevitably display a wide variety of skills and backgrounds within its workforce. In fact, it is equally as common to characterize the IT industry by the types of jobs available as it is by the industries which are technology driven (which, as mentioned above, is nearly all of them). Regardless of how one chooses to view the positions within IT, it is clear that there are a variety of positions available in a variety of industries. One common trend across all IT positions in all industries is the increasing importance of technical and professional occupations as the field continues to evolve and expand in new directions.

The Bureau of Labor Statistics' (BLS) Standard Occupational Classification (SOC) system identifies numerous job titles that fall within the information technology industry. For our purposes, the job titles (and corresponding SOC codes) that we will be including in our analysis of the information technology industry are as follows: Network and Computer Systems Administrators (151071), Computer Software Engineers, Systems Software (151032), Computer Systems Analysts (151051), Computer Software Engineers, Applications (151031), Network Systems and Data Communications Analysts (151081). These particular job titles were chosen based upon their combination of relatively high projected employment growth, median salaries, and current vacancy needs.

Using survey data received from employers, we were able to determine which Knowledge Areas and Work Activities would be most beneficial to applicants looking for work in the information technology industry. According to the data for this industry and these positions, it is most beneficial for applicants to have knowledge in Computers and Electronics, Customer and Personal Service, Engineering and Technology, English Language, Mathematics, and Telecommunications. Also, it is beneficial for applicants to have work experience in Communication with Supervisors, Peers, or Subordinates; Getting Information; Identifying Objects, Actions, and Events; Inspecting Equipment, Structures, or Materials; Making Decisions and Solving Problems; and Updating and Using Relevant Knowledge.

Analysis of Information Technology Cluster

From the sample population of 1595 respondents, 301 respondents (about 18.9 percent of the population) were clustered into the Information Technology cluster. This group is well suited to occupations in the IT sector due to their education or work history and would need relatively less training than the population as a whole. The cluster had an average skill level of 3.24 in the critical knowledge variables and an average skill level of 4.56 in the work activity variables critical to occupations in IT, and an average level of 3.12 in all knowledge and work activity variables. A higher average skill level in the critical variables than in all variables combined means that the population within this cluster are better suited, educationally and experientially, in occupations within the IT sector than they are suited for all occupations in general. When compared to the occupational cluster as shown below, with an average occupational skill level across the knowledge critical variables of 4.17 and 4.54 in the critical work activity variables, it would appear that, while the clustered population is better suited than the rest of the population

to perform the occupations within Information Technology, they would still need some educational and experiential support.

Table 2 compares the critical skill levels of the IT clustered population with those levels required by the IT occupational cluster, with the analysis across all variables in Appendix F. Within the knowledge variables, the IT clustered population falls short in the variables of Computers and Electronics, Engineering and Technology, and Telecommunications. Using the level translation table of formal education required to achieve each O*NET level developed earlier, we begin to see what needs to be done to educate the clustered population to the level which is needed by the occupations within the IT field.

The IT clustered population has, on average, a level of 3.69 in the Computers and Electronics skill variable. This is roughly commensurate with some education beyond high school in the field. We see that in the following table occupations within the IT occupational cluster need, on average a 5.5 level in the variable, or roughly a bachelor's degree. This does not mean that the region should put everyone through four years of computer and electronics courses, but gives us an idea of what more needs to be done. From here we can look at the courses that would typically be given, or skills that would be taught within the bachelor's degree curriculum, and decide if there is a cost effective and efficient way to deliver some of this knowledge to the portion of the population that would most benefit. The average level of Engineering and Technology within the IT clustered population is at 1.47, just under the high school level, while the average occupation needs a level of 3.93 in the variable, about an associate degree level. The average skill level in Telecommunications for the IT clustered population is 1.39, whereas the target occupations require a level of about 3.94, almost an associate degree level.

Within the Work Activity variables, the IT clustered population only falls short in the variable of Interacting with Computers. While the population may be very comfortable using computers the occupations within the IT group call for a more detailed interaction, so some additional training need is to be expected. A gap analysis in the work activity variables is more subjective than that done with the knowledge variables. These tasks are harder to quantify than the knowledge variables, and commensurate time in training is given as a range. However, implementation of a strategy to train the population to meet the work activity needs of employers may be easier and more efficient for the region. The average level of Interacting with Computers within the IT clustered population is at 3.46, between a several months to a year of training or experience, while the average occupation needs a level of 4.76, minimum of two years of training or experience. Again, this does not mean that the population needs a definitive two years of job training in computers, but it helps us quantify approximately how much of a training need exists.

Table 2. Gap analysis for skill set held by IT population cluster compared to skill set needed for IT occupational cluster.

	IT Population Cluster	IT Average Level Needed	Gap
Telecommunications	1.39	3.94	2.55
Engineering & Technology	1.47	3.93	2.46
Computers & Electronics	3.69	5.49	1.80
Interacting with Computers	3.46	4.76	1.30
Updating & Using Relevant Information	4.77	5.28	0.51
Mathematics	3.86	3.82	-0.04
Identifying Objects, Actions, or Events	4.48	4.34	-0.14
Making Decisions & Problem Solving	4.89	4.39	-0.50
Communication with Supervisors, Peers, or Subordinates	5.04	4.50	-0.54
English Language	4.28	3.74	-0.54
Customer Service	4.74	4.07	-0.67
Getting Information	4.74	3.96	-0.78
Average Critical Variables	3.90	4.35	
Average all Variables	3.12	2.74	
Average Knowledge Variables	3.24	4.17	
Average Work Activity Variables	4.56	4.54	

Analysis of Agricultural Business & Food Technology

From the sample population of 1,595 respondents, 374 respondents (about 23 percent of the population) were clustered into the Ag Business & Food Tech occupational cluster. This group is well suited to occupations in the sector due to their education or work experience. The cluster had an average skill level of 2.85 in the critical knowledge variables and an average skill level of 3.87 in the work activity variables critical to occupations in Ag Business, and an average level of 2.52 in all knowledge and work activity variables. When compared to the target cluster of occupations as shown in Table 5, with an average occupational skill level across the knowledge critical variables of 3.52 and 4.25 in the critical work activity variables, we see that the clustered population group needs education and training in both the knowledge variables and the work activities.

Table 5 below, comparing the clustered population and the occupational cluster by the variables critical to those occupations, shows in which variables the population may be in need of supplemental training. As with our analysis in the other clusters, it is more efficient to consider those variables in which a gap of about 1.01 or more exists. This is greater than one standard deviation and is a significant difference. Allocating resources to every knowledge or work activity variable in which a small difference exists may not be possible or at least reasonable.

The Ag Business & Food Tech clustered population fell short in only one critical variable, that of Biology. The area of Biology is unique to the Ag Business group, and so cannot be compared as easily across groups though it does have some overlap with the knowledge variable of Medicine

& Dentistry within the Healthcare cluster. As with the skills gap in the other clusters, it is common to see the largest gap within the critical variables, as is the case here. This is because the level of knowledge needed in the occupationally critical variables is significantly higher than the generalized level gained from standard educational coursework. The Ag Business & Food Tech clustered population has, on average, a level of 1.52 in the Biology skill variable. This is roughly commensurate with a level of education just above the ninth grade. We see in the table below that occupations within the Ag Business & Food Tech occupational cluster need, on average a 3.23 level in the variable, or roughly a high school level. Again, it is difficult to quantify the exact solution to this deficiency in years of formal education, especially since the occupations within the group vary considerably in required education. While a food technologist and a veterinarian will both need a certain level of education in biology, those levels will vary greatly. The data provided here should be used to see which areas of skills and education are critical to key occupations and in which areas may the population need additional training.

Table 3. Gap analysis for skill set held by the Agricultural Business & Food Technology population cluster compared to skill set needed by the occupational cluster.

	Ag Business & Food Tech Population Cluster	Ag Business & Food Tech Average	Gap
Biology	1.52	3.23	1.71
Documenting & Recording Information	3.19	3.78	0.59
Monitor Processes, Materials, or Surroundings	3.84	4.42	0.58
Identifying Objects, Actions, or Events	3.78	4.35	0.57
Customer Service	3.19	3.71	0.52
Getting Information	3.78	4.17	0.39
Updating & Using Relevant Information	4.26	4.61	0.35
Mathematics	3.39	3.64	0.25
English Language	3.29	3.50	0.21
Making Decisions & Problem Solving	4.17	4.38	0.21
Communication with Supervisors, Peers, or Subordinates	4.10	4.06	-0.04
Average Critical Variables	3.50	3.99	
Average all Variables	2.52	2.77	
Average Knowledge Variables	2.85	3.52	
Average Work Activity Variables	3.87	4.25	

Analysis of Healthcare Cluster

From the sample population of 1,595 respondents, 618 respondents (about 39 percent of the population) were clustered into the Healthcare cluster. This group is well suited to occupations in the Healthcare sector due to their education or work history and would need relatively less training than the population as a whole. The cluster had an average skill level of 2.22 in the critical knowledge variables and an average skill level of 3.35 in the work activity variables critical to occupations in Healthcare, and an average level of 1.98 in all knowledge and work activity variables. A higher average skill level in the critical variables than in all variables combined means that the population within this cluster are better suited, educationally and

experientially, in occupations within the Healthcare sector than they are suited for all occupations in general. When compared to the occupational cluster as shown below, with an average occupational skill level across the knowledge critical variables of 4.12 and 4.72 in the critical work activity variables, it would appear that, while the clustered population is better suited than the rest of the population to perform the occupations within Healthcare, they would still need some educational and experiential support.

Table 4 below compares the critical skill levels of the Healthcare clustered population with those levels required by the Healthcare occupational cluster, with the analysis across all variables in Appendix F. Within the knowledge variables, the Healthcare clustered population falls short in the variables of Medicine & Dentistry, Therapy & Counseling, and Psychology. Using the level translation table of formal education required to achieve each O*NET level developed earlier, we begin to see what needs to be done to educate the clustered population to the level which is needed by the occupations within the Healthcare field. Within the work activity variables, the Healthcare clustered population falls short in the variables of Assisting & Caring for Others, Updating & Using Relevant Information, Documenting & Recording Information, Making Decisions & Problem Solving, and Getting Information. It is notable that the gap between the current skills set and that skills set needed by the occupations within the cluster is larger in the Healthcare cluster than seen in the other selected clusters. This is a combination of two reasons. One, the critical variables within the Healthcare cluster are much less taught in the standard educational system. Coursework in mathematics, computers, and biology is much more prevalent than courses in medicine & dentistry, psychology, and therapy & counseling. The second reason is one of clustering technique. Many of the people within the sample that could have been clustered into the Healthcare group were also well suited for one of the other two groups. These people may have been placed in the other groups because they fit the critical variables within that group slightly better than in the Healthcare group.

Both of these have important implications for the region. Coursework and training to promote the Healthcare group may not have the same crossover effects seen in training for other groups. For example, educating and training a group of people for the Information Technology sector also prepares them for occupations within Advanced Manufacturing and some Engineering related occupations. Training within the Healthcare occupational group is much more specific.

It is not surprising that the largest gap in skills for the population to perform occupations in the healthcare occupational group is knowledge of Medicine & Dentistry. The Healthcare clustered population has, on average, a level of .88 in the Medicine & Dentistry skill variable. This is roughly commensurate with about a ninth grade level of understanding in the field. We see in the Table 4 that occupations within the Healthcare occupational cluster need, on average, a 3.63 level in the variable, or just below an associate degree. It is normal that the population would fall short of education within a highly technical and specialized field. This does not mean that the region should put everyone through two years of Medicine & Dentistry courses, but gives us an idea of what more needs to be done. From here we can look at the courses that would typically be given, or skills that would be taught within the associate degree curriculum, and decide if there is a cost effective and efficient way to deliver some of this knowledge to the

portion of the population that would most benefit. The average level of Psychology within the Healthcare clustered population is at 2.03, some coursework at the high school level, while the average occupation needs a level of 4.37 in the variable, just above an associate degree level. The average skill level in Therapy & Counseling for the Healthcare clustered population is 1.03 whereas the target occupations require a level of about 3.72, almost an associate degree level.

Table 4. Gap analysis for skill set held by Healthcare population cluster compared to skill set needed by Healthcare occupational cluster.

	Healthcare Population Cluster	Healthcare Average Level Needed	Gap
Medicine & Dentistry	0.88	3.63	2.75
Therapy & Counseling	1.03	3.72	2.69
Psychology	2.03	4.37	2.34
Assisting & Caring for Others	2.94	4.88	1.94
Updating & Using Relevant Information	3.38	5.05	1.67
Documenting & Recording Information	2.71	4.31	1.60
Making Decisions & Problem Solving	3.12	4.72	1.60
Getting Information	3.40	4.68	1.28
Customer Service	3.91	4.89	0.98
Communication with Supervisors, Peers, or Subordinates	3.61	4.48	0.87
English Language	3.26	4.01	0.75
Establishing & Maintaining Interpersonal Relationships	4.31	4.93	0.62
Average Critical Variables	2.88	4.47	
Average all Variables	1.98	2.96	
Average Knowledge Variables	2.22	4.12	
Average Work Activity Variables	3.35	4.72	

Conclusion

When analyzing the data for education and policy decisions it is important to remember what a Skillshed analysis can do and what it cannot do. A Skillshed analysis is an important tool for analyzing the strengths and weaknesses in the current set of skills of the population, or clustered sub sets of the population, when compared to the necessary set of skills for an occupational cluster. From the analysis, we can build a directory of critical knowledge areas or work activities that the population needs to satisfy selected occupational clusters. We can also estimate the level of those critical skills held by the population and compare that with the educational or experiential needs of the occupational cluster. A Skillshed is less appropriate, however, when used to show exactly how many years of training a population needs to meet the needs of a specific occupation. A Skillshed analysis is more appropriate on the general level of showing in which areas of training or education a region's workforce is more skilled or less skilled. Referring back to the tables for each occupational group, we see that the population is closer to meeting the required level of work activity to satisfy the target occupations than it is at meeting the required level within the knowledge areas. This is consistent with the analysis in other regional Skillsheds and supports the argument for expanding opportunities in the number of occupations that are considered apprenticeable. The population is well-prepared to perform the occupations on a skills-basis, but needs support in developing the educational knowledge

specific to the job. As many of the occupations within the three target clusters are highly specialized, it may be more effective to deliver the needed training through a job-specific program rather than a traditional approach. Another possible solution would be to develop the delivery system of required education within the region to non-traditional students. The majority of the population is working adults with little time or resources to attend traditional, daytime classes. A technology-based delivery system better suits their needs and can be delivered at a lower cost.

Table 7 below shows the critical areas for the three target occupational groups and in which areas the population may need supplemental education or training. Programs of education or skills training in the shared areas of needed training are those in which the region would benefit most. From the analysis, we see that there are no areas in which training is needed for more than one group. This means that the population studied is very well prepared in terms of general education and training, but requires further training in occupation-specific knowledge and activities.

Table 7. Critical knowledge areas and work activities in which the population clusters need additional training to satisfy the needs of the occupational clusters.

	IT Population Cluster	Ag Business & Food Tech Population Cluster	Healthcare Population Cluster
Assisting & Caring for Others	No	No	Yes
Biology	No	Yes	No
Communication with Supervisors, Peers, or Subordinates	No	No	No
Computers & Electronics	Yes	No	No
Customer Service	No	No	No
Documenting & Recording Information	No	No	Yes
Engineering & Technology	Yes	No	No
English Language	No	No	No
Establishing & Maintaining Interpersonal Relationships	No	No	No
Getting Information	No	No	Yes
Identifying Objects, Actions, or Events	No	No	No
Interacting with Computers	Yes	No	No
Making Decisions & Problem Solving	No	No	Yes
Mathematics	No	No	No
Medicine & Dentistry	No	No	Yes
Monitor Processes, Materials, or Surroundings	No	No	No
Psychology	No	No	Yes
Telecommunications	Yes	No	No
Therapy & Counseling	No	No	Yes
Updating & Using Relevant Information	No	No	Yes

Appendix A: O*NET Level Anchors and Level Translation

O*NET uses a scaling system of one to seven to designate the level of proficiency needed in a skill or knowledge area for an occupation. O*NET also provides a directory of level anchors to guide the user in interpreting the progressive difficulty of each level. By reviewing the anchors across all skills and knowledge areas we can estimate a commensurate level of education or years of experience needed to achieve a level within a specific skill or knowledge area. Below is a sample of the level anchors provided in the O*NET database.

Skill	Anchor Value	Anchor Description
Biology	1	Feed domestic animals
Computers and Electronics	1	Operate a VCR to watch a pre-recorded training tape
Mathematics	1	Add two numbers
Medicine and Dentistry	1	Use a band-aid
Public Safety and Security	1	Use a seatbelt
Thinking Creatively	1	Change the spacing on a printed report
Active Listening	2	Take a customer's order
Chemistry	2	Use a common household bug spray
Clerical	2	File letters alphabetically
Customer and Personal Service	2	Process customer dry-cleaning drop off
English Language	2	Write a thank you note
Geography	2	Know the capital of the United States
Mathematics	2	Count the amount of change to be given to a customer
Mechanical	2	Replace the filters in a furnace
Sales and Marketing	2	Sell cakes at a bake sale
Speaking	2	Greet tourists and explain tourist attractions
Therapy and Counseling	2	Put ice on a sprained ankle
Writing	2	Take a telephone message
Written Comprehension	2	Understand signs on the highway
Clerical	3	Type 30 words per minute
Computers and Electronics	3	Use a word processor
Number Facility	3	Balance a checkbook
Personnel and Human Resources	3	Interview applicants for a secretarial position
Spatial Orientation	3	Find your way through a dark room without hitting anything
Active Listening	4	Answer inquiries regarding credit references
Administration and Management	4	Monitor progress of a project to ensure timely completion
Customer and Personal Service	4	Work as a day care aide supervising 10 children
Economics and Accounting	4	Develop financial investment programs for individual clients
English Language	4	Edit a feature article in a local newspaper
Getting Information	4	Review a budget
Interacting With Computers	4	Write software for keeping track of parts in inventory
Making Decisions and Solving Problems	4	Select the location for a major department store
Mathematics	4	Analyze data to determine areas with the highest sales
Mechanical	4	Replace a valve on a steam pipe
Processing Information	4	Calculate the adjustments for insurance claims
Psychology	4	Understand the impact of alcohol on human responses
Repairing and Maintaining Electronic Equipment	4	Make repairs by removing and replacing circuit boards
Therapy and Counseling	4	Provide job counseling to the unemployed
Thinking Creatively	4	Adapt popular music for a high school marching band
Writing	4	Write a memo to staff outlining new directives
Written Comprehension	4	Understand an apartment lease
Biology	5	Investigate the effects of pollution on marine plants and animals
Clerical	5	Organize a storage system for company forms
Food Production	5	Operate a commercial fishing boat

Appendix A (continued)

Skill	Anchor Value	Anchor Description
Medicine and Dentistry	5	Fill a tooth cavity
Number Facility	5	Compute the interest payment that should be generated from an investment
Sociology and Anthropology	5	Write a pamphlet about cultural differences
Transportation	5	Steer a large freighter through a busy harbor
Administration and Management	6	Manage a \$10 million company
Computers and Electronics	6	Create a program to scan computer disks for viruses
Customer and Personal Service	6	Respond to a citizen's request for assistance after a major disaster
Economics and Accounting	6	Keep a major corporation's financial records
English Language	6	Teach a college English class
Getting Information	6	Study international tax laws
Interacting With Computers	6	Set up a new computer system for a large multinational company
Making Decisions and Solving Problems	6	Make the final decision about a company's 5-year plan
Mathematics	6	Derive a complex mathematical equation
Psychology	6	Treat a person with severe mental illness
Repairing and Maintaining Electronic Equipment	6	Use complex test equipment to calibrate electronic equipment
Therapy and Counseling	6	Counsel an abused child
Thinking Creatively	6	Create new computer software
Written Comprehension	6	Understand an instruction book on repairing missile guidance systems
Biology	7	Isolate and identify a new virus
Mechanical	7	Overhaul an airplane jet engine
Medicine and Dentistry	7	Perform open heart surgery
Provide Consultation and Advice to Others	7	Provide ideas for changing an organization to increase profitability
Resolving Conflicts and Negotiating with Others	7	Negotiate a major labor-management contract
Sociology and Anthropology	7	Create a new theory about the development of civilizations
Telecommunications	7	Develop a new, world-wide telecommunications network

To estimate relevant levels of education and experience, we separated the skills into those related to formal education (knowledge areas) and those related to work tasks. The table below shows the estimate used to translate the O*NET level into a commensurate level of education or experience.

	O*NET Level	Level Translation
Knowledge	1	Less than 9th Grade
Work Related Activity	1	No previous experience
Knowledge	2	Some High School, No diploma
Work Related Activity	2	Less than a few weeks training or experience
Knowledge	3	Completed High School
Work Related Activity	3	Up to several months of training or experience
Knowledge	4	Associate level
Work Related Activity	4	At least one year of training or experience
Knowledge	5	Bachelor's level
Work Related Activity	5	Minimum of two to four years training or experience
Knowledge	6	Post Graduate level
Work Related Activity	6	At least five to ten years of training or experience
Knowledge	7	Post Graduate level plus experience
Work Related Activity	7	Greater than ten years of training or experience

Appendix B: O*NET Knowledge and Work Activity Variables

The O*NET database measures the skills needed in each occupation and assigns a skill level for the occupation within each skill variable. Knowledge area variables are more directly related to formal education. Work activity variables are more closely associated with experience. The table below shows the 74 work activity and knowledge variables used by O*NET.

Work Activity	Knowledge Area
Analyzing Data or Information	Administration and Management
Assisting and Caring for Others	Biology
Coaching and Developing Others	Building and Construction
Communicating with Persons Outside Organization	Chemistry
Communicating with Supervisors, Peers, or Subordinates	Clerical
Controlling Machines and Processes	Communications and Media
Coordinating the Work and Activities of Others	Computers and Electronics
Developing and Building Teams	Customer and Personal Service
Developing Objectives and Strategies	Design
Documenting/Recording Information	Economics and Accounting
Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment	Education and Training
Establishing and Maintaining Interpersonal Relationships	Engineering and Technology
Estimating the Quantifiable Characteristics of Products, Events, or Information	English Language
Evaluating Information to Determine Compliance with Standards	Fine Arts
Getting Information	Food Production
Guiding, Directing, and Motivating Subordinates	Foreign Language
Handling and Moving Objects	Geography
Identifying Objects, Actions, and Events	History and Archeology
Inspecting Equipment, Structures, or Material	Law and Government
Interacting With Computers	Mathematics
Interpreting the Meaning of Information for Others	Mechanical
Judging the Qualities of Things, Services, or People	Medicine and Dentistry
Making Decisions and Solving Problems	Personnel and Human Resources
Monitor Processes, Materials, or Surroundings	Philosophy and Theology
Monitoring and Controlling Resources	Physics
Operating Vehicles, Mechanized Devices, or Equipment	Production and Processing
Organizing, Planning, and Prioritizing Work	Psychology
Performing Administrative Activities	Public Safety and Security
Performing for or Working Directly with the Public	Sales and Marketing
Performing General Physical Activities	Sociology and Anthropology
Processing Information	Telecommunications
Provide Consultation and Advice to Others	Therapy and Counseling
Repairing and Maintaining Electronic Equipment	Transportation
Repairing and Maintaining Mechanical Equipment	
Resolving Conflicts and Negotiating with Others	
Scheduling Work and Activities	
Selling or Influencing Others	
Staffing Organizational Units	
Thinking Creatively	
Training and Teaching Others	
Updating and Using Relevant Knowledge	

Appendix C: Laborshed analysis with location quotient

Below is shown the trend analysis of the South Central Iowa Area Partnership and Iowa Statewide Laborshed data. Location quotient is a measurement of relative concentration of employment. Any Location Quotient above 1 means that more people are employed in that occupational category, when adjusting for population size, within the region than within the state as a whole.

Occupational Category	Location Quotient 2007	Location Quotient 2008	Change in Location Quotient
Community and Social Services	0.96	1.45	0.49
Education, Training, and Library	0.98	1.43	0.45
Computer & Mathematical	0.99	1.39	0.41
Personal Care and Services	0.91	1.38	0.47
Management	0.93	1.24	0.31
Business and Financial Operations	1.09	1.20	0.11
Healthcare Support	0.96	1.12	0.15
Healthcare Practitioners	1.08	1.07	-0.01
Office and Administrative Support	1.03	1.06	0.03
Life, Physical, and Social Science	0.64	1.05	0.41
Arts, Design, Entertainment, Sports, and Media	0.82	0.96	0.14
Sales and Related	0.80	0.93	0.13
Legal	1.03	0.88	-0.15
Transportation and Material Moving	1.41	0.86	-0.56
Building and Grounds Cleaning and Maintenance	1.12	0.74	-0.38
Farming, Fishing, and Forestry	1.74	0.72	-1.01
Production	0.99	0.71	-0.27
Installation, Maintenance, and Repair	1.11	0.68	-0.43
Food Preparation and Serving	0.70	0.61	-0.08
Construction and Extraction	1.31	0.54	-0.77
Architecture & Engineering	0.84	0.54	-0.30
Protective Services	1.05	0.52	-0.53

Appendix D: 15 Knowledge Clusters, Projected Employment, and Median Wages

The Purdue Center for Regional Development developed the framework for the 15 Knowledge Clusters. Knowledge Clusters are based on O*NET job zones and agglomerated by similar tasks. Shown below are the occupations by projected percentage change in employment in Iowa and nationally and median hourly wage. Asterisks mark those occupations without sufficient data to report.

1. Managerial, Sales, Marketing and HR

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
111011	Chief executives	0.59%	0.20%	\$62.57
111021	General and operations managers	0.40%	0.15%	\$39.91
112011	Advertising and promotions managers	*	0.62%	\$30.75
112021	Marketing managers	1.23%	1.44%	\$38.57
112022	Sales managers	1.32%	1.02%	\$40.85
112031	Public relations managers	1.37%	1.69%	\$33.42
113011	Administrative services managers	1.40%	1.17%	\$33.71
113031	Financial managers	1.74%	1.26%	\$40.51
113041	Compensation and benefits managers	*	1.20%	\$32.47
113042	Training and development managers	*	1.56%	\$34.26
113049	Human resources managers, all other	*	1.14%	\$40.11
113061	Purchasing managers	*	0.34%	\$37.24
113071	Transportation, storage, and distribution managers	0.96%	0.83%	\$33.64
119051	Food service managers	1.01%	0.50%	\$19.71
119071	Gaming managers	*	2.44%	\$27.33
119081	Lodging managers	1.61%	1.22%	\$17.76
119141	Property, real estate, and community association managers	1.43%	1.51%	\$19.54
131071	Employment, recruitment, and placement specialists	1.93%	1.84%	\$21.19
131072	Compensation, benefits, and job analysis specialists	3.04%	1.84%	\$19.84
131081	Logisticians	2.58%	1.73%	\$28.13
131111	Management analysts	2.12%	2.19%	\$29.58
131121	Meeting and convention planners	*	1.99%	\$19.47
193021	Market research analysts	2.57%	2.01%	\$23.24
193022	Survey researchers	*	1.59%	\$33.89
273031	Public relations specialists	1.28%	1.76%	\$21.42
351011	Chefs and head cooks	*	0.76%	\$18.36
411012	First-line supervisors/managers of non-retail sales workers	0.80%	0.37%	\$29.42
413011	Advertising sales agents	2.39%	2.03%	\$15.86
413031	Securities, commodities, and financial services sales agents	3.16%	2.48%	\$21.21
419031	Sales engineers	*	0.85%	\$37.56
434161	Human resources assistants, except payroll and timekeeping	1.19%	1.13%	\$16.15
Average		1.62%	1.32%	\$29.60

Appendix D (continued)

2. Skilled Production Workers: Technicians, Operators, Trades, Installers & Repairers

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
113051	Industrial production managers	0.50%	-0.59%	\$39.95
119021	Construction managers	1.32%	1.57%	\$34.81
172141	Mechanical engineers	0.75%	0.42%	\$30.77
173012	Electrical and electronics drafters	*	0.41%	\$21.45
173027	Mechanical engineering technicians	*	0.64%	\$21.16
371011	First-line supervisors of housekeeping and janitorial workers	1.30%	1.27%	\$16.49
471011	First-line supervisors of construction trades and extraction workers	1.31%	0.91%	\$25.21
472022	Stonemasons	*	1.00%	\$16.71
472031	Carpenters	1.11%	1.03%	\$15.58
472051	Cement masons and concrete finishers	1.79%	1.14%	\$14.83
472073	Operating engineers and other construction equipment operators	1.32%	0.84%	\$19.41
472111	Electricians	1.42%	0.74%	\$22.57
472152	Plumbers, pipefitters, and steamfitters	1.90%	1.06%	\$20.42
474021	Elevator installers and repairers	*	0.88%	\$36.22
491011	First-line supervisors of mechanics, installers, and repairers	0.83%	0.73%	\$25.91
492093	Electrical and electronics installers and repairers, transportation equipment	*	0.43%	*
492094	Electrical and electronics repairers, commercial and industrial equipment	0.93%	0.68%	\$25.26
492095	Electrical and electronics repairers, powerhouse, substation, and relay	*	-0.47%	\$28.02
492096	Electronic equipment installers and repairers, motor vehicles	*	0.46%	\$12.32
493023	Automotive service technicians and mechanics	1.88%	1.43%	\$15.43
493031	Bus and truck mechanics and diesel engine specialists	1.69%	1.15%	\$17.23
493041	Farm equipment mechanics	-0.20%	0.14%	\$15.69
493042	Mobile heavy equipment mechanics, except engines	1.21%	1.23%	\$19.14
493051	Motorboat mechanics	*	1.90%	\$14.40
493052	Motorcycle mechanics	1.63%	1.25%	\$14.62
499021	Heating, air conditioning, and refrigeration mechanics and installers	1.67%	0.87%	\$17.38
499031	Home appliance repairers	0.27%	0.15%	\$15.58
499041	Industrial machinery mechanics	1.60%	0.90%	\$19.33
499042	Maintenance and repair workers, general	1.15%	1.01%	\$15.79
499044	Millwrights	2.13%	0.58%	\$19.16
499051	Electrical power-line installers and repairers	0.72%	0.72%	\$25.70
499092	Commercial divers	*	1.77%	*
511011	First-line supervisors/managers of production and operating workers	0.39%	-0.48%	\$23.27
512041	Structural metal fabricators and fitters	0.26%	-0.02%	\$15.52
514041	Machinists	0.35%	-0.31%	\$16.62
514111	Tool and die makers	-0.13%	-0.96%	\$20.75
517011	Cabinetmakers and bench carpenters	2.05%	0.28%	\$11.72
518012	Power distributors and dispatchers	*	-0.49%	\$28.17
518013	Power plant operators	0.42%	0.27%	\$24.97
518021	Stationary engineers and boiler operators	*	0.34%	\$18.52
518092	Gas plant operators	*	-0.99%	\$25.20
519195	Molders, shapers, and casters, except metal and plastic	*	0.13%	\$13.37
535031	Ship engineers	*	1.41%	*
536051	Transportation inspectors	*	1.64%	\$24.84
537021	Crane and tower operators	*	0.28%	\$21.03
Average		1.09%	0.61%	\$20.96

Appendix D (continued)

3. Healthcare

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
291031	Dietitians and nutritionists	0.75%	0.86%	\$23.11
291021	Dentists, general	0.55%	0.92%	\$63.70
291121	Audiologists	*	0.98%	\$27.66
291041	Optometrists	*	1.13%	\$40.96
292091	Orthotists and prosthetists	*	1.18%	\$45.18
291011	Chiropractors	*	1.44%	\$30.19
119111	Medical and health services managers	1.66%	1.64%	\$31.98
191042	Medical scientists, except epidemiologists	*	2.02%	\$26.94
291126	Respiratory therapists	2.10%	2.26%	\$21.63
291071	Physician assistants	2.28%	2.70%	\$37.23
292054	Respiratory therapy technicians	*	0.09%	\$17.75
519082	Medical appliance technicians	*	0.94%	\$18.01
292011	Medical and clinical laboratory technologists	0.79%	1.24%	\$23.54
319094	Medical transcriptionists	1.73%	1.35%	\$14.24
292033	Nuclear medicine technologists	*	1.48%	\$29.89
292051	Dietetic technicians	*	1.48%	\$11.08
292034	Radiologic technologists and technicians	1.56%	1.51%	\$21.25
292071	Medical records and health information technicians	1.68%	1.78%	\$13.35
292032	Diagnostic medical sonographers	*	1.91%	\$27.95
291051	Pharmacists	2.63%	2.17%	\$46.05
499062	Medical equipment repairers	2.09%	2.17%	\$21.73
292055	Surgical technologists	2.27%	2.45%	\$16.68
291124	Radiation therapists	*	2.48%	\$29.70
292031	Cardiovascular technologists and technicians	*	2.55%	\$20.73
292021	Dental hygienists	2.77%	3.01%	\$29.96
319092	Medical assistants	3.63%	3.54%	\$13.50
292056	Veterinary technologists and technicians	3.40%	4.10%	\$13.29
291127	Speech-language pathologists	1.12%	1.06%	\$26.30
211012	Educational, vocational, and school counselors	1.33%	1.26%	\$19.99
292061	Licensed practical and licensed vocational nurses	1.35%	1.40%	\$17.01
193031	Clinical, counseling, and school psychologists	1.11%	1.58%	\$25.07
211021	Child, family, and school social workers	2.33%	1.91%	\$17.77
211015	Rehabilitation counselors	3.00%	2.30%	\$12.25
291122	Occupational therapists	2.67%	2.31%	\$28.77
291111	Registered nurses	2.46%	2.35%	\$23.71
211022	Medical and public health social workers	3.29%	2.42%	\$18.89
312011	Occupational therapist assistants	*	2.54%	\$19.88
291123	Physical therapists	2.74%	2.71%	\$32.48
211013	Marriage and family therapists	3.62%	2.98%	\$15.02
211023	Mental health and substance abuse social workers	3.78%	2.99%	\$17.66
211014	Mental health counselors	2.79%	3.00%	\$14.46
312021	Physical therapist assistants	3.07%	3.24%	\$16.69
211011	Substance abuse and behavioral disorder counselors	2.94%	3.43%	\$16.82
Average		2.25%	2.02%	\$24.19

Appendix D (continued)

4. Mathematics, Statistics, Data and Accounting

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
113021	Computer and information systems managers	1.88%	1.64%	\$46.35
113031	Financial managers	1.74%	1.26%	\$40.51
131023	Purchasing agents, except wholesale, retail, and farm products	0.46%	0.01%	\$21.50
132011	Accountants and auditors	1.99%	1.77%	\$24.39
132031	Budget analysts	*	0.71%	\$28.54
132051	Financial analysts	2.42%	3.38%	\$27.92
132061	Financial examiners	*	1.07%	\$33.80
151021	Computer programmers	-0.15%	-0.41%	\$28.38
151061	Database administrators	2.71%	2.86%	\$31.30
152011	Actuaries	2.33%	2.37%	\$40.70
152021	Mathematicians	*	1.02%	*
152031	Operations research analysts	*	1.06%	\$25.35
152041	Statisticians	*	0.85%	\$30.61
152091	Mathematical technicians	*	0.79%	*
193011	Economists	*	0.75%	\$27.76
439011	Computer operators	-1.88%	-2.47%	\$14.40
439111	Statistical assistants	*	0.76%	\$18.16
Average		1.28%	1.02%	\$29.31

Appendix D (continued)

5. Legal and Financial Services and Real Estate

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
131031	Claims adjusters, examiners, and investigators	3.19%	0.89%	\$23.47
131032	Insurance appraisers, auto damage	*	1.25%	\$19.90
131051	Cost estimators	2.25%	1.85%	\$23.32
131071	Employment, recruitment, and placement specialists	1.93%	1.84%	\$21.19
132021	Appraisers and assessors of real estate	1.49%	1.69%	\$21.68
132041	Credit analysts	0.48%	0.19%	\$23.11
132052	Personal financial advisors	3.05%	4.10%	\$25.67
132053	Insurance underwriters	1.84%	0.63%	\$26.91
132071	Loan counselors	*	0.40%	\$16.46
132072	Loan officers	1.97%	1.15%	\$25.23
132081	Tax examiners, collectors, and revenue agents	*	0.21%	\$27.18
132082	Tax preparers	*	-0.84%	\$12.23
231011	Lawyers	1.29%	1.10%	\$37.45
231021	Administrative law judges, adjudicators, and hearing officers	*	0.01%	*
231023	Judges, magistrate judges, and magistrates	*	0.51%	\$18.15
232011	Paralegals and legal assistants	2.26%	2.22%	\$19.29
232091	Court reporters	*	2.45%	\$30.40
232092	Law clerks	*	-0.12%	\$12.82
232093	Title examiners, abstractors, and searchers	*	-0.12%	\$14.48
254011	Archivists	*	1.44%	*
254031	Library technicians	1.40%	0.85%	\$10.47
339021	Private detectives and investigators	*	1.82%	\$20.49
413021	Insurance sales agents	3.66%	1.29%	\$19.78
413031	Securities, commodities, and financial services sales agents	3.16%	2.48%	\$21.21
419021	Real estate brokers	1.22%	1.11%	\$27.80
433011	Bill and account collectors	2.77%	2.29%	\$13.68
433021	Billing and posting clerks and machine operators	1.01%	0.44%	\$14.17
433031	Bookkeeping, accounting, and auditing clerks	1.58%	1.25%	\$13.95
433051	Payroll and timekeeping clerks	0.40%	0.31%	\$15.75
433061	Procurement clerks	*	-0.21%	\$15.92
434011	Brokerage clerks	1.30%	2.00%	\$15.50
434031	Court, municipal, and license clerks	0.71%	0.88%	\$14.92
434041	Credit authorizers, checkers, and clerks	*	-0.84%	\$13.43
434061	Eligibility interviewers, government programs	0.28%	0.31%	\$20.50
434071	File clerks	-3.95%	-4.13%	\$9.45
434121	Library assistants, clerical	1.43%	0.79%	\$9.25
434131	Loan interviewers and clerks	0.39%	-0.09%	\$14.62
436011	Executive secretaries and administrative assistants	1.65%	1.48%	\$17.80
436012	Legal secretaries	1.13%	1.17%	\$15.07
Average		1.46%	0.87%	\$18.99

Appendix D (continued)

6. Information Technology

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
173024	Electro-mechanical technicians	*	0.26%	\$22.00
492011	Computer, automated teller, and office machine repairers	0.13%	0.30%	\$16.42
173023	Electrical and electronic engineering technicians	0.48%	0.36%	\$24.46
172061	Computer hardware engineers	*	0.46%	\$34.56
492091	Avionics technicians	*	0.81%	*
274012	Broadcast technicians	*	1.21%	\$13.62
151041	Computer support specialists	1.44%	1.29%	\$18.65
274011	Audio and video equipment technicians	*	2.42%	\$13.35
151071	Network and computer systems administrators	2.53%	2.70%	\$28.22
151032	Computer software engineers, systems software	2.51%	2.82%	\$35.88
151051	Computer systems analysts	2.93%	2.90%	\$32.61
151031	Computer software engineers, applications	4.29%	4.46%	\$34.06
151081	Network systems and data communications analysts	4.75%	5.34%	\$30.48
Average		2.38%	1.95%	\$25.36

7. Natural Sciences and Environmental Management

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
119121	Natural sciences managers	*	1.14%	\$47.85
171021	Cartographers and photogrammetrists	*	2.03%	*
173031	Surveying and mapping technicians	*	1.94%	\$17.78
191011	Animal scientists	*	0.98%	\$29.71
191013	Soil and plant Scientists	0.82%	0.84%	\$27.88
191021	Biochemists and biophysicists	*	1.59%	*
191022	Microbiologists	*	1.12%	\$30.67
191023	Zoologists and wildlife biologists	*	0.87%	\$25.73
191029	Biological scientists, all other	*	0.37%	\$32.75
191031	Conservation scientists	*	0.53%	\$23.11
191032	Foresters	*	*	*
192021	Atmospheric and space scientists	*	1.06%	\$32.35
192041	Environmental scientists and specialists, including health	*	2.51%	\$29.00
192042	Geoscientists, except hydrologists and geographers	*	2.19%	\$28.57
192043	Hydrologists	*	2.43%	*
194041	Geological and petroleum technicians	*	0.86%	*
194091	Environmental science and protection technicians, including health	1.16%	2.80%	\$23.01
194093	Forest and conservation technicians	*	*	*
332022	Forest fire inspectors and prevention specialists	*	*	*
454011	Forest and conservation workers	*	*	*
Average		0.99%	1.45%	\$29.03

Appendix D (continued)

8. Agribusiness and Food Technology

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
119011	Farm, ranch, and other agricultural managers	*	0.11%	\$26.59
119012	Farmers and ranchers	-0.79%	-0.85%	*
131021	Purchasing agents and buyers, farm products	*	-0.86%	\$21.93
191012	Food scientists and technologists	*	1.03%	\$26.93
194011	Agricultural and food science technicians	1.01%	0.66%	\$14.23
194021	Biological technicians	1.13%	1.60%	*
194031	Chemical technicians	0.65%	0.58%	\$20.04
259021	Farm and home management advisors	*	0.51%	\$20.41
291131	Veterinarians	3.45%	3.50%	\$31.23
373012	Pesticide handlers, sprayers, and applicators, vegetation	0.88%	1.40%	\$13.78
452011	Agricultural inspectors	*	-0.11%	\$20.34
452021	Animal breeders	*	0.44%	\$11.35
454023	Log graders and scalers	*	-0.53%	*
518031	Water and liquid waste treatment plant and system operators	1.49%	1.38%	\$17.01
Average		1.12%	0.63%	\$20.35

9. Primary/Secondary and Vocational Education, Remediation and Social Services

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
119031	Education administrators, preschool and child care center/program	2.31%	2.35%	\$15.13
119032	Education administrators, elementary and secondary school	1.03%	0.76%	*
119151	Social and community service managers	3.02%	2.47%	\$21.40
131073	Training and development specialists	2.03%	1.83%	\$20.78
194061	Social science research assistants	*	1.24%	\$18.34
211091	Health educators	*	2.62%	\$19.32
211093	Social and human service assistants	3.26%	3.36%	\$12.30
212011	Clergy	*	1.89%	\$20.76
212021	Directors, religious activities and education	*	1.97%	\$21.27
231022	Arbitrators, mediators, and conciliators	*	1.06%	\$24.25
252011	Preschool teachers, except special education	2.46%	2.63%	\$10.03
252012	Kindergarten teachers, except special education	1.82%	1.63%	*
252021	Elementary school teachers, except special education	1.61%	1.36%	*
252022	Middle school teachers, except special and vocational education	1.38%	1.12%	*
252023	Vocational education teachers, middle school	*	-0.51%	*
252031	Secondary school teachers, except special and vocational education	0.81%	0.56%	*
252032	Vocational education teachers, secondary school	-0.26%	-0.46%	*
252041	Special education teachers, preschool, kindergarten, and elementary	2.17%	1.96%	*
252042	Special education teachers, middle school	2.05%	1.58%	*
252043	Special education teachers, secondary school	1.19%	0.85%	*
253011	Adult literacy, remedial education, and GED teachers and instructors	*	1.42%	\$15.63
259031	Instructional coordinators	2.52%	2.25%	\$27.59
259041	Teacher assistants	1.28%	1.04%	*
272022	Coaches and scouts	1.62%	1.46%	*
272023	Umpires, referees, and other sports officials	*	1.60%	*
299091	Athletic trainers	*	2.43%	*
399032	Recreation workers	1.40%	1.27%	\$9.57
399041	Residential advisors	1.55%	1.85%	\$11.07
434111	Interviewers, except eligibility and loan	1.02%	0.95%	\$11.05
Average		1.71%	1.54%	\$17.23

Appendix D (continued)

10. Building, Landscape, and Construction Design

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
173013	Mechanical drafters	0.73%	0.52%	\$30.61
173011	Architectural and civil drafters	0.59%	0.61%	\$20.90
173022	Civil engineering technicians	1.19%	1.02%	\$19.81
194061	Social science research assistants	*	1.24%	\$18.34
193051	Urban and regional planners	*	1.45%	\$26.34
171012	Landscape architects	*	1.64%	\$26.57
171011	Architects, except landscape and naval	1.65%	1.77%	\$29.40
474011	Construction and building inspectors	1.53%	1.82%	\$23.14
173031	Surveying and mapping technicians	*	1.94%	\$17.78
171022	Surveyors	2.57%	2.37%	\$21.30
Average		1.38%	1.44%	\$23.42

11. Engineering and Related Services

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
172072	Electronics engineers, except computer	*	0.37%	\$35.08
172131	Materials engineers	*	0.40%	\$33.61
172071	Electrical engineers	0.63%	0.63%	\$35.65
271021	Commercial and industrial designers	*	0.72%	\$19.85
119041	Engineering managers	0.46%	0.73%	\$47.53
172041	Chemical engineers	*	0.79%	\$38.35
172021	Agricultural engineers	*	0.86%	\$30.47
192032	Materials scientists	*	0.87%	*
192031	Chemists	1.40%	0.91%	\$27.45
172111	Health and safety engineers, except mining safety engineers and inspectors	*	0.96%	\$30.19
173026	Industrial engineering technicians	2.00%	0.99%	\$21.09
172151	Mining and geological engineers, including mining safety engineers	*	1.00%	*
172011	Aerospace engineers	*	1.02%	*
173021	Aerospace engineering and operations technicians	*	1.04%	*
518011	Nuclear power reactor operators	*	1.06%	*
172121	Marine engineers and naval architects	*	1.09%	*
172051	Civil engineers	1.82%	1.80%	\$35.33
172112	Industrial engineers	2.84%	2.03%	\$30.58
172031	Biomedical engineers	*	2.11%	\$32.25
173025	Environmental engineering technicians	*	2.48%	\$17.90
172081	Environmental engineers	*	2.54%	\$33.82
Average		1.52%	1.16%	\$31.28

Appendix D (continued)

12. Personal Services Occupations

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
253021	Self-enrichment education teachers	2.07%	2.31%	\$17.47
319011	Massage therapists	*	2.03%	\$14.47
352013	Cooks, private household	*	0.88%	*
391021	First-line supervisors/managers of personal service workers	1.52%	1.55%	\$15.04
395011	Barbers	*	0.11%	*
395012	Hairdressers, hairstylists, and cosmetologists	0.74%	1.24%	\$10.31
395092	Manicurists and pedicurists	*	2.76%	\$7.88
395094	Skin care specialists	*	3.43%	\$13.42
396021	Tour guides and escorts	2.50%	2.12%	\$10.58
396022	Travel guides	*	1.05%	*
399011	Child care workers	2.50%	1.78%	\$8.11
399031	Fitness trainers and aerobics instructors	3.69%	2.68%	\$10.40
413041	Travel agents	1.40%	0.10%	\$12.34
499064	Watch repairers	*	-0.51%	\$17.45
Average		2.06%	1.54%	\$12.50

13. Arts, Entertainment, Publishing and Broadcasting

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
131011	Agents and business managers of artists, performers, and athletes	*	0.96%	\$21.12
271011	Art directors	*	0.90%	\$27.68
271013	Fine artists, including painters, sculptors, and illustrators	*	0.99%	\$18.68
271014	Multi-media artists and animators	*	2.58%	\$18.92
271022	Fashion designers	*	0.50%	*
271024	Graphic designers	1.05%	0.98%	\$17.07
271025	Interior designers	1.68%	1.95%	\$17.83
271027	Set and exhibit designers	*	1.78%	*
272012	Producers and directors	1.20%	1.11%	\$22.04
272032	Choreographers	0.50%	0.24%	\$15.18
272041	Music directors and composers	*	1.29%	*
273011	Radio and television announcers	-0.08%	-0.83%	\$11.04
273021	Broadcast news analysts	*	0.60%	\$24.23
273022	Reporters and correspondents	0.55%	0.12%	\$11.86
273041	Editors	0.48%	0.23%	\$20.92
273042	Technical writers	1.31%	1.95%	\$23.75
273043	Writers and authors	0.88%	1.28%	\$18.51
273091	Interpreters and translators	2.05%	2.36%	\$14.72
274013	Radio operators	*	-1.63%	*
274014	Sound engineering technicians	*	0.91%	*
274021	Photographers	0.59%	1.03%	\$12.25
274031	Camera operators, television, video, and motion picture	*	1.15%	\$21.37
274032	Film and video editors	*	1.27%	\$21.25
439031	Desktop publishers	*	0.10%	\$14.25
439081	Proofreaders and copy markers	*	0.64%	\$11.33
492097	Electronic home entertainment equipment installers and repairers	*	0.30%	\$13.88
499063	Musical instrument repairers and tuners	*	0.28%	\$18.65
519071	Jewelers and precious stone and metal workers	*	-0.22%	\$17.07
519195	Molders, shapers, and casters, except metal and plastic	*	0.13%	\$13.37
Average		0.93%	0.79%	\$17.79

Appendix D (continued)

14. Public Safety and Domestic Security

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
131061	Emergency management specialists	*	1.23%	\$18.21
172111	Health and safety engineers, except mining safety engineers and inspectors	*	0.96%	\$30.19
194092	Forensic science technicians	*	3.07%	*
299011	Occupational health and safety specialists	1.77%	0.81%	\$27.35
299012	Occupational health and safety technicians	*	1.46%	\$19.17
331011	First-line supervisors/managers of correctional officers	*	1.25%	\$29.89
331012	First-line supervisors/managers of police and detectives	1.15%	0.92%	\$31.65
331021	First-line supervisors/managers of fire fighting and prevention workers	*	1.15%	\$26.57
332011	Fire fighters	1.95%	1.21%	\$17.54
332021	Fire inspectors and investigators	*	1.10%	\$26.54
333012	Correctional officers and jailers	1.72%	1.69%	\$19.77
333021	Detectives and criminal investigators	*	1.73%	\$29.22
333031	Fish and game wardens	*	-0.02%	\$26.19
333051	Police and sheriff's patrol officers	1.76%	1.08%	\$21.71
532021	Air traffic controllers	*	1.02%	\$40.50
532022	Airfield operations specialists	*	1.18%	\$12.43
535021	Captains, mates, and pilots of water vessels	*	1.79%	\$27.35
536041	Traffic technicians	*	0.99%	*
536051	Transportation inspectors	*	1.64%	\$24.84
Average		1.67%	1.28%	\$25.24

15. Postsecondary Education and Knowledge Creation

SOC	Occupation	Projected Employment Change 2006-2016 (Iowa)	Projected Employment Change 2006-2016 (National)	Median Wage (Iowa)
119033	Education administrators, postsecondary	1.29%	1.42%	\$35.95
152021	Mathematicians	*	1.02%	*
152041	Statisticians	*	0.85%	\$30.61
192011	Astronomers	*	0.56%	*
192012	Physicists	*	0.68%	*
192031	Chemists	1.40%	0.91%	\$27.45
193011	Economists	*	0.75%	\$27.76
193032	Industrial-organizational psychologists	*	2.13%	*
193041	Sociologists	*	1.00%	*
193091	Anthropologists and archeologists	*	1.50%	\$19.59
193092	Geographers	*	0.61%	*
193093	Historians	*	0.78%	*
193094	Political scientists	*	0.53%	*
254012	Curators	*	2.33%	\$18.88
254013	Museum Technicians and Conservators	*	1.59%	\$23.91
254021	Librarians	0.74%	0.36%	\$22.33
Average		1.14%	1.06%	\$25.81

Appendix E: Current Skillshed of Regional Workforce by three clusters and as a whole

	IT Cluster	Ag Business & Food Tech Cluster	Healthcare Cluster	Population
Administration and Mgmt	3.98	3.235	2.49	3.22234043
Biology	0.495	1.52	0.515	0.89278908
Building and Construction	1.225	1.495	0.37	1.13928801
Chemistry	1.795	1.45	0.895	1.42374732
Clerical	3.945	2.79	3.205	3.16892398
Communications and Media	2.615	1.595	1.805	1.97195396
Computers and Electronics	3.69	3.08	2.505	2.95122591
Customer Service	4.74	3.185	3.905	3.91879015
Design	1.62	2.155	0.605	1.49920771
Economics and Accounting	2.53	1.76	1.72	2.0075803
Education and Training	4.525	3.125	2.535	3.34467345
Engineering and Technology	1.465	2.515	0.6	1.47873126
English Language	4.28	3.285	3.255	3.55256959
Fine Arts	0.84	0.17	0.335	0.46205567
Food Production	0.525	0.505	0.58	0.59725375
Foreign Language	1.38	0.695	0.815	0.94652034
Geography	2.105	0.83	1.04	1.3579015
History	1.535	0.3	0.575	0.81407923
Law and Government	3.01	1.985	1.695	2.18535867
Mathematics	3.86	3.385	2.77	3.30924518
Mechanical	1.63	2.74	0.99	1.82411135
Medicine and Dentistry	1.855	0.575	0.875	1.12324411
Human Resources	3.25	2.02	1.805	2.35681478
Philosophy and Theology	2.46	0.62	0.985	1.33712527
Physics	1.29	1.325	0.405	1.06273019
Production and Processing	2.02	2.745	1.355	2.00843148
Psychology	3.935	1.92	2.03	2.59117773
Public Safety an Security	3.03	2.45	1.85	2.42991435
Sales and Marketing	2.66	1.385	1.84	2.09223769
Sociology and Anthropology	2.635	0.855	1.065	1.50686296
Telecommunications	1.385	1.54	1.06	1.24299251
Therapy and Counseling	2.605	0.67	1.03	1.4610546
Transportation	1.845	1.485	1.21	1.58232869
Assisting and Caring for Others	3.885	2.51	2.935	3.04930407
Coaching and Developing Others	4.36	3.025	2.44	3.22605996
Communicating with persons outside of Organization	4.505	2.825	2.87	3.455894
Communicating with persons inside organization	5.035	4.095	3.605	4.1667666

Appendix E (continued)

	IT Cluster	Ag Business & Food Tech Cluster	Adv Mfg Cluster	Population
Controlling Machines and Processes	1.9	3.5	1.6	2.25859743
Coordinating Work and Activities	4.45	3.2	2.42	3.32566916
Developing and Building Teams	3.85	2.73	1.935	2.78529443
Developing Objectives and Strategies	3.915	2.885	1.86	2.84647752
Documenting and Recording Information	3.585	3.185	2.705	3.05293897
Drafting, Laying Out and Specifying Devices and Equip.	1.365	1.865	0.535	1.24957173
Establishing and Maintaining Interpersonal Relationships	5.28	4.275	4.305	4.58307281
Estimating Quantifiable Characteristics	2.96	2.84	1.825	2.51538009
Evaluating information to Determine Compliance	3.995	3.405	2.515	3.23944325
Getting Information	4.735	3.78	3.39	3.96219486
Guiding, Directing, and Motivating Subordinates	3.945	2.865	1.76	2.78953426
Handling and Moving Objects	2.925	4.05	2.97	3.33950214
Identifying Objects, Actions, and Events	4.475	3.775	3.265	3.78881692
Inspecting Equipment, Structures, or Materials	2.65	3.1	1.98	2.54558887
Interacting with Computers	3.46	3.065	2.43	2.82362955
Interpreting the Meaning of Information	3.66	2.83	2.02	2.7883137
Judging the Qualities of Things, Services, or People	4.235	3.29	2.505	3.35308351
Making Decisions and Problem Solving	4.89	4.165	3.115	4.00519272
Monitoring Processes, Materials, and Surroundings	4.29	3.835	3.1	3.71707709
Monitoring and Controlling Resources	3.87	2.72	1.695	2.73162206
Operating Vehicles or Equipment	1.13	2.195	0.86	1.44920236
Organizing, Planning, and Prioritizing Work	5.165	4.375	3.695	4.32583512
Performing Administrative Activities	3.765	2.55	2.36	2.82861349
Performing for or Working with the Public	3.975	1.595	3.31	3.10173983
Performing General Physical Activities	2.38	3.25	2.31	2.68694861
Processing Information	3.975	3.885	3.065	3.54251606
Provide Consultation and Advice to Others	4.045	2.965	1.89	2.92098501
Repairing and Maintaining Electronic Equipment	1.26	2.25	0.795	1.34547109
Repairing and Maintaining Mechanical Equipment	1.33	2.565	0.895	1.55317987
Resolving Conflicts and Negotiating with Others	4.7	3.105	2.9	3.51927195
Scheduling Work and Activities	4.115	3.315	2.425	3.21840471
Selling or Influencing Others	3.495	2.06	1.865	2.52758565
Staffing Organizational Units	2.74	1.695	1.01	1.79630086
Thinking Creatively	4.32	3.63	2.59	3.45249465
Training and Teaching Others	3.745	3.085	2.4	3.02458244
Updating and Using relevant Knowledge	4.765	4.255	3.375	4.05512313
Average Critical Variables	3.90	3.50	2.88	
Average all Variables	3.12	2.52	1.98	2.52
Average Knowledge Variables	3.24	2.84	2.22	2.25
Average Work Activity Variables	4.56	3.87	3.35	3.72

Appendix F: Gap Analysis of Current Skillshed and Average Level Needed by Occupational Cluster.

	IT Population Cluster	IT Average Level Needed
Administration and Mgmt	3.98	3.32
Biology	0.495	0.32
Building and Construction	1.225	1.04
Chemistry	1.795	1.06
Clerical	3.945	2.94
Communications and Media	2.615	2.78
Computers and Electronics	3.69	5.49
Customer Service	4.74	4.07
Design	1.62	3.16
Economics and Accounting	2.53	1.29
Education and Training	4.525	3.72
Engineering and Technology	1.465	3.93
English Language	4.28	3.74
Fine Arts	0.84	0.43
Food Production	0.525	0.05
Foreign Language	1.38	0.60
Geography	2.105	1.27
History	1.535	0.40
Law and Government	3.01	1.79
Mathematics	3.86	3.82
Mechanical	1.63	2.99
Medicine and Dentistry	1.855	0.43
Human Resources	3.25	1.48
Philosophy and Theology	2.46	0.58
Physics	1.29	1.95
Production and Processing	2.02	2.40
Psychology	3.935	1.65
Public Safety an Security	3.03	2.36
Sales and Marketing	2.66	1.62
Sociology and Anthropology	2.635	0.84
Telecommunications	1.385	3.94
Therapy and Counseling	2.605	0.53
Transportation	1.845	1.35
Assisting and Caring for Others	3.885	2.22
Coaching and Developing Others	4.36	2.80
Communicating with persons outside of Organization	4.505	3.35
Communicating with persons inside organization	5.035	4.51

Appendix F (continued)

	IT Population Cluster	IT Average Level Needed
Controlling Machines and Processes	1.9	3.16
Coordinating Work and Activities	4.45	3.08
Developing and Building Teams	3.85	2.41
Developing Objectives and Strategies	3.915	3.09
Documenting and Recording Information	3.585	3.66
Drafting, Laying Out and Specifying Devices and Equip.	1.365	2.55
Establishing and Maintaing Interpersonal Relationships	5.28	4.53
Estimating Quantifiable Characteristics	2.96	3.06
Evaluating information to Determine Compliance	3.995	3.54
Getting Information	4.735	3.96
Guiding, Directing, and Motivating Subordinates	3.945	2.25
Handling and Moving Objects	2.925	3.47
Identifying Objects, Actions, and Events	4.475	4.34
Inspecting Equipment, Structures, or Materials	2.65	3.37
Interacting with Computers	3.46	4.76
Interpreting the Meaning of Information	3.66	3.38
Judging the Qualities of Things, Services, or People	4.235	3.36
Making Decisions and Problem Solving	4.89	4.39
Monitoring Processes, Materials, and Surroundings	4.29	4.29
Monitoring and Controlling Resources	3.87	2.56
Operating Vehicles or Equipment	1.13	1.42
Organizing, Planning, and Prioritizing Work	5.165	4.62
Performing Administrative Activities	3.765	2.52
Performing for or Working with the Public	3.975	2.13
Performing General Physical Activities	2.38	2.72
Processing Information	3.975	4.27
Provide Consultation and Advice to Others	4.045	3.53
Repairing and Maintaining Electronic Equipment	1.26	4.14
Repairing and Maintaining Mechanical Equipment	1.33	2.55
Resolving Conflicts and Negotiating with Others	4.7	2.78
Scheduling Work and Activities	4.115	3.56
Selling or Influencing Others	3.495	2.04
Staffing Organizational Units	2.74	1.28
Thinking Creatively	4.32	4.60
Training and Teaching Others	3.745	3.23
Updating and Using relevant Knowledge	4.765	5.28
Average Critical Variables	3.90	4.35
Average all Variables	3.12	2.74
Average Knowledge Variables	3.24	4.17
Average Work Activity Variables	4.56	4.54

Appendix F (continued)

	Ag Business & Food Tech Population Cluster	Ag Business & Food Tech Average Level Needed
Administration and Mgmt	3.235	3.00
Biology	1.52	3.24
Building and Construction	1.495	1.67
Chemistry	1.45	3.35
Clerical	2.79	2.96
Communications and Media	1.595	1.95
Computers and Electronics	3.08	2.92
Customer Service	3.185	3.72
Design	2.155	1.63
Economics and Accounting	1.76	1.82
Education and Training	3.125	3.27
Engineering and Technology	2.515	2.21
English Language	3.285	3.51
Fine Arts	0.17	0.22
Food Production	0.505	2.23
Foreign Language	0.695	0.90
Geography	0.83	1.90
History	0.3	0.75
Law and Government	1.985	2.59
Mathematics	3.385	3.64
Mechanical	2.74	2.99
Medicine and Dentistry	0.575	1.41
Human Resources	2.02	2.13
Philosophy and Theology	0.62	0.86
Physics	1.325	1.85
Production and Processing	2.745	2.94
Psychology	1.92	1.97
Public Safety an Security	2.45	2.58
Sales and Marketing	1.385	2.46
Sociology and Anthropology	0.855	1.19
Telecommunications	1.54	0.92
Therapy and Counseling	0.67	0.94
Transportation	1.485	2.12
Assisting and Caring for Others	2.51	2.42
Coaching and Developing Others	3.025	2.94
Communicating with persons outside of Organization	2.825	3.43
Communicating with persons inside organization	4.095	4.06

Appendix F (continued)

	Ag Business & Food Tech Population Cluster	Ag Business & Food Tech Average Level Needed
Controlling Machines and Processes	3.5	3.16
Coordinating Work and Activities	3.2	3.15
Developing and Building Teams	2.73	2.31
Developing Objectives and Strategies	2.885	3.01
Documenting and Recording Information	3.185	3.78
Drafting, Laying Out and Specifying Devices and Equip.	1.865	1.36
Establishing and Maintaing Interpersonal Relationships	4.275	4.36
Estimating Quantifiable Characteristics	2.84	3.15
Evaluating information to Determine Compliance	3.405	3.41
Getting Information	3.78	4.17
Guiding, Directing, and Motivating Subordinates	2.865	2.74
Handling and Moving Objects	4.05	4.31
Identifying Objects, Actions, and Events	3.775	4.35
Inspecting Equipment, Structures, or Materials	3.1	3.45
Interacting with Computers	3.065	2.61
Interpreting the Meaning of Information	2.83	2.95
Judging the Qualities of Things, Services, or People	3.29	3.67
Making Decisions and Problem Solving	4.165	4.38
Monitoring Processes, Materials, and Surroundings	3.835	4.42
Monitoring and Controlling Resources	2.72	3.23
Operating Vehicles or Equipment	2.195	2.43
Organizing, Planning, and Prioritizing Work	4.375	4.52
Performing Administrative Activities	2.55	2.64
Performing for or Working with the Public	1.595	3.03
Performing General Physical Activities	3.25	3.73
Processing Information	3.885	4.16
Provide Consultation and Advice to Others	2.965	2.73
Repairing and Maintaining Electronic Equipment	2.25	1.70
Repairing and Maintaining Mechanical Equipment	2.565	2.37
Resolving Conflicts and Negotiating with Others	3.105	3.14
Scheduling Work and Activities	3.315	3.45
Selling or Influencing Others	2.06	2.49
Staffing Organizational Units	1.695	1.62
Thinking Creatively	3.63	3.57
Training and Teaching Others	3.085	3.07
Updating and Using relevant Knowledge	4.255	4.61
Average Critical Variables	3.50	3.99
Average all Variables	2.52	2.77
Average Knowledge Variables	2.84	3.53
Average Work Activity Variables	3.87	4.25

Appendix F (continued)

	Healthcare Population Cluster	Healthcare Average Level Needed
Administration and Mgmt	2.49	2.81
Biology	0.515	2.89
Building and Construction	0.37	0.53
Chemistry	0.895	2.54
Clerical	3.205	3.40
Communications and Media	1.805	2.23
Computers and Electronics	2.505	3.33
Customer Service	3.905	4.89
Design	0.605	1.09
Economics and Accounting	1.72	1.57
Education and Training	2.535	4.05
Engineering and Technology	0.6	1.67
English Language	3.255	4.01
Fine Arts	0.335	0.50
Food Production	0.58	0.47
Foreign Language	0.815	1.30
Geography	1.04	1.07
History	0.575	0.87
Law and Government	1.695	2.63
Mathematics	2.77	3.14
Mechanical	0.99	1.80
Medicine and Dentistry	0.875	3.63
Human Resources	1.805	2.57
Philosophy and Theology	0.985	2.26
Physics	0.405	1.68
Production and Processing	1.355	1.67
Psychology	2.03	4.37
Public Safety an Security	1.85	2.53
Sales and Marketing	1.84	2.07
Sociology and Anthropology	1.065	2.72
Telecommunications	1.06	1.21
Therapy and Counseling	1.03	3.72
Transportation	1.21	1.31
Assisting and Caring for Others	2.935	4.88
Coaching and Developing Others	2.44	3.63
Communicating with persons outside of Organization	2.87	3.83
Communicating with persons inside organization	3.605	4.48

Appendix F (continued)

	Healthcare Population Cluster	Healthcare Average Level Needed
Controlling Machines and Processes	1.6	2.54
Coordinating Work and Activities	2.42	3.53
Developing and Building Teams	1.935	3.16
Developing Objectives and Strategies	1.86	3.41
Documenting and Recording Information	2.705	4.31
Drafting, Laying Out and Specifying Devices and Equip.	0.535	1.13
Establishing and Maintaing Interpersonal Relationships	4.305	4.93
Estimating Quantifiable Characteristics	1.825	2.73
Evaluating information to Determine Compliance	2.515	4.04
Getting Information	3.39	4.68
Guiding, Directing, and Motivating Subordinates	1.76	3.00
Handling and Moving Objects	2.97	3.39
Identifying Objects, Actions, and Events	3.265	4.82
Inspecting Equipment, Structures, or Materials	1.98	3.01
Interacting with Computers	2.43	3.05
Interpreting the Meaning of Information	2.02	3.47
Judging the Qualities of Things, Services, or People	2.505	3.77
Making Decisions and Problem Solving	3.115	4.72
Monitoring Processes, Materials, and Surroundings	3.1	4.65
Monitoring and Controlling Resources	1.695	2.80
Operating Vehicles or Equipment	0.86	1.23
Organizing, Planning, and Prioritizing Work	3.695	4.63
Performing Administrative Activities	2.36	3.13
Performing for or Working with the Public	3.31	4.22
Performing General Physical Activities	2.31	2.82
Processing Information	3.065	4.29
Provide Consultation and Advice to Others	1.89	3.51
Repairing and Maintaining Electronic Equipment	0.795	1.41
Repairing and Maintaining Mechanical Equipment	0.895	1.44
Resolving Conflicts and Negotiating with Others	2.9	3.84
Scheduling Work and Activities	2.425	3.56
Selling or Influencing Others	1.865	2.63
Staffing Organizational Units	1.01	2.07
Thinking Creatively	2.59	3.84
Training and Teaching Others	2.4	3.74
Updating and Using relevant Knowledge	3.375	5.05
Average Critical Variables	2.88	4.47
Average all Variables	1.98	2.96
Average Knowledge Variables	2.22	4.12
Average Work Activity Variables	3.35	4.72

Appendix G: Knowledge and Work Activity Definitions

Knowledge Variables

Administration and Management : Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.

Clerical : Knowledge of administrative and clerical procedures and systems such as word processing, managing files and records, stenography and transcription, designing forms, and other office procedures and terminology.

Economics and Accounting : Knowledge of economic and accounting principles and practices, the financial markets, banking and the analysis and reporting of financial data.

Sales and Marketing : Knowledge of principles and methods for showing, promoting, and selling products or services. This includes marketing strategy and tactics, product demonstration, sales techniques, and sales control systems.

Customer and Personal Service : Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction.

Personnel and Human Resources : Knowledge of principles and procedures for personnel recruitment, selection, training, compensation and benefits, labor relations and negotiation, and personnel information systems.

Transportation : Knowledge of principles and methods for moving people or goods by air, rail, sea, or road, including the relative costs and benefits.

Production and Processing : Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.

Food Production : Knowledge of techniques and equipment for planting, growing, and harvesting food products (both plant and animal) for consumption, including storage/handling techniques.

Computers and Electronics : Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.

Engineering and Technology : Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.

Design : Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.

Building and Construction : Knowledge of materials, methods, and the tools involved in the construction or repair of houses, buildings, or other structures such as highways and roads.

Mechanical : Knowledge of machines and tools, including their designs, uses, repair, and maintenance.

Mathematics : Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.

Physics : Knowledge and prediction of physical principles, laws, their interrelationships, and applications to understanding fluid, material, and atmospheric dynamics, and mechanical, electrical, atomic and sub-atomic structures and processes.

Chemistry : Knowledge of the chemical composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques, and disposal.

Biology : Knowledge of plant and animal organisms, their tissues, cells, functions, interdependencies, and interactions with each other and the environment.

Psychology : Knowledge of human behavior and performance; individual differences in ability, personality, and interests; learning and motivation; psychological research methods; and the assessment and treatment of behavioral and affective disorders.

Sociology and Anthropology : Knowledge of group behavior and dynamics, societal trends and influences, human migrations, ethnicity, cultures and their history and origins.

Geography : Knowledge of principles and methods for describing the features of land, sea, and air masses, including their physical characteristics, locations, interrelationships, and distribution of plant, animal, and human life.

Medicine and Dentistry : Knowledge of the information and techniques needed to diagnose and treat human injuries, diseases, and deformities. This includes symptoms, treatment alternatives, drug properties and interactions, and preventive health-care measures.

Therapy and Counseling : Knowledge of principles, methods, and procedures for diagnosis, treatment, and rehabilitation of physical and mental dysfunctions, and for career counseling and guidance.

Education and Training : Knowledge of principles and methods for curriculum and training design, teaching and instruction for individuals and groups, and the measurement of training effects.

English Language : Knowledge of the structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.

Foreign Language : Knowledge of the structure and content of a foreign (non-English) language including the meaning and spelling of words, rules of composition and grammar, and pronunciation.

Fine Arts : Knowledge of the theory and techniques required to compose, produce, and perform works of music, dance, visual arts, drama, and sculpture.

History and Archeology : Knowledge of historical events and their causes, indicators, and effects on civilizations and cultures.

Philosophy and Theology : Knowledge of different philosophical systems and religions. This includes their basic principles, values, ethics, ways of thinking, customs, practices, and their impact on human culture.

Public Safety and Security : Knowledge of relevant equipment, policies, procedures, and strategies to promote effective local, state, or national security operations for the protection of people, data, property, and institutions.

Law and Government : Knowledge of laws, legal codes, court procedures, precedents, government regulations, executive orders, agency rules, and the democratic political process.

Telecommunications : Knowledge of transmission, broadcasting, switching, control, and operation of telecommunications systems.

Communications and Media : Knowledge of media production, communication, and dissemination techniques and methods. This includes alternative ways to inform and entertain via written, oral, and visual media.

Work Activity Variables

Getting Information : Observing, receiving, and otherwise obtaining information from all relevant sources.

Monitor Processes, Materials, or Surroundings : Monitoring and reviewing information from materials, events, or the environment, to detect or assess problems.

Identify and Evaluating Job-Relevant Information : How is information interpreted to perform this job?

Identifying Objects, Actions, and Events : Identifying information by categorizing, estimating, recognizing differences or similarities, and detecting changes in circumstances or events.

Inspecting Equipment, Structures, or Material : Inspecting equipment, structures, or materials to identify the cause of errors or other problems or defects.

Estimating the Quantifiable Characteristics of Products, Events, or Information : Estimating sizes, distances, and quantities; or determining time, costs, resources, or materials needed to perform a work activity.

Judging the Qualities of Things, Services, or People : Assessing the value, importance, or quality of things or people.

Processing Information : Compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data.

Evaluating Information to Determine Compliance with Standards : Using relevant information and individual judgment to determine whether events or processes comply with laws, regulations, or standards.

Analyzing Data or Information : Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts.

Making Decisions and Solving Problems : Analyzing information and evaluating results to choose the best solution and solve problems.

Thinking Creatively : Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.

Updating and Using Relevant Knowledge : Keeping up-to-date technically and applying new knowledge to your job.

Developing Objectives and Strategies : Establishing long-range objectives and specifying the strategies and actions to achieve them.

Scheduling Work and Activities : Scheduling events, programs, and activities, as well as the work of others.

Organizing, Planning, and Prioritizing Work : Developing specific goals and plans to prioritize, organize, and accomplish your work.

Performing General Physical Activities : Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling of materials.

Handling and Moving Objects : Using hands and arms in handling, installing, positioning, and moving materials, and manipulating things.

Controlling Machines and Processes : Using either control mechanisms or direct physical activity to operate machines or processes (not including computers or vehicles).

Operating Vehicles, Mechanized Devices, or Equipment : Running, maneuvering, navigating, or driving vehicles or mechanized equipment, such as forklifts, passenger vehicles, aircraft, or water craft.

Interacting With Computers : Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.

Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment : Providing documentation, detailed instructions, drawings, or specifications to tell others about how devices, parts, equipment, or structures are to be fabricated, constructed, assembled, modified, maintained, or used.

Repairing and Maintaining Mechanical Equipment : Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles.

Repairing and Maintaining Electronic Equipment : Servicing, repairing, calibrating, regulating, fine-tuning, or testing machines, devices, and equipment that operate primarily on the basis of electrical or electronic (not mechanical) principles.

Documenting/Recording Information : Entering, transcribing, recording, storing, or maintaining information in written or electronic/magnetic form.

Interpreting the Meaning of Information for Others : Translating or explaining what information means and how it can be used.

Communicating with Supervisors, Peers, or Subordinates : Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.

Communicating with Persons Outside Organization : Communicating with people outside the organization, representing the organization to customers, the public, government, and other external sources. This information can be exchanged in person, in writing, or by telephone or e-mail.

Establishing and Maintaining Interpersonal Relationships : Developing constructive and cooperative working relationships with others, and maintaining them over time.

Assisting and Caring for Others : Providing personal assistance, medical attention, emotional support, or other personal care to others such as coworkers, customers, or patients.

Selling or Influencing Others : Convincing others to buy merchandise/goods or to otherwise change their minds or actions.

Resolving Conflicts and Negotiating with Others : Handling complaints, settling disputes, and resolving grievances and conflicts, or otherwise negotiating with others.

Performing for or Working Directly with the Public : Performing for people or dealing directly with the public. This includes serving customers in restaurants and stores, and receiving clients or guests.

Coordinating the Work and Activities of Others : Getting members of a group to work together to accomplish tasks.

Developing and Building Teams : Encouraging and building mutual trust, respect, and cooperation among team members.

Training and Teaching Others : Identifying the educational needs of others, developing formal educational or training programs or classes, and teaching or instructing others.

Guiding, Directing, and Motivating Subordinates : Providing guidance and direction to subordinates, including setting performance standards and monitoring performance.

Coaching and Developing Others : Identifying the developmental needs of others and coaching, mentoring, or otherwise helping others to improve their knowledge or skills.

Provide Consultation and Advice to Others : Providing guidance and expert advice to management or other groups on technical, systems-, or process-related topics.

Performing Administrative Activities : Performing day-to-day administrative tasks such as maintaining information files and processing paperwork.

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