MINNESOTA PIPELINE PROJECT

PRIVATE INVESTMENT, PUBLIC EDUCATION
LABOR AND INDUSTRY EXPERIENCE

ADVANCED MANUFACTURING

AGRICULTURE

HEALTH CARE SERVICES

INFORMATION TECHNOLOGY

MINNESOTA DEPARTMENT OF
LABOR & INDUSTRY

2015 PROGRESS REPORT TO THE MINNESOTA LEGISLATURE

EXECUTIVE SUMMARY

The Minnesota Private Investment, Public Education, Labor and Industry Experience (PIPELINE) Project is a legislatively directed initiative managed by the Minnesota Department of Labor and Industry (DLI) in collaboration with the Department of Employment and Economic Development (DEED) and Minnesota State Colleges and Universities (MnSCU).

Minnesota Laws 2014, Chapter 312, Article 3, Sec. 21 calls for the state agencies to work with recognized industry experts, representative employers, higher education institutions, and labor representatives to define competency standards for occupations in:

- advanced manufacturing
- agriculture
- health care services
- information technology

DLI convened an Industry Council for each of the four industries and conducted three meetings between August and November 2014.

These meetings resulted in a greater shared understanding of industry workforce needs, the identification of occupations that could benefit from dual-training, and recommendations and ideas for next steps to support and expand dual-training in Minnesota. The Industry Councils continue to develop competency standards models for 15 identified occupations.

The outcomes for the PIPELINE initiative include establishing, verifying, and developing competency standards in at least one entry-level and two higher-skill level occupations for each industry and submitting a progress report and recommendations to the legislature by Jan. 15, 2015.

PIPELINE PROJECT FINDINGS

- There is high demand for employees in entry, mid- and advanced-level occupations in Advanced Manufacturing, Agriculture, Information Technology, and Health Care Services.
- Employers and industry representatives support competency-based workforce development and dual-training systems and they are engaged to further develop programs to help meet workforce needs.
- Employers and industry representatives recognize and value their role in identifying and validating competencies for identified occupations.
- Given sufficient resources, government has the ability to provide the infrastructure, tools, and assistance to help employers develop and manage dual-training programs.
- Education and organized labor can assist employers with early exposure, hiring, recruiting and related instruction for dual-training programs.
- It is essential to promote awareness about high-growth and high-demand industries and dual-training opportunities in these fields, especially to young people, people of color, women and veterans.
- Long-term and widespread employer engagement in dual-training systems requires an analysis of the costs and impact on productivity, revenue and employee tenure.

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RECOMMENDATIONS

1. **Complete occupational competency standards for all occupations identified through the PIPELINE Project.**
   Fifteen occupations have been identified by the Industry Councils that could be developed through dual-training. DLI began to develop occupation specific competency standards models based on the competency models developed by the US DOL. Six PIPELINE occupation competency standards models for related instruction and on-the-job training are developed. Competency standards models will continue to be developed through June 2015 for the remaining identified occupations.

2. **Build industry Competency Councils for each targeted industry to develop competency standards for additional occupations in each industry.**
   Industry Council representatives with broad industry knowledge have named subject matter experts to serve on Competency Councils to develop competencies that will be delivered through a combination of on-the-job training and related instruction. Each industry will have its own Competency Council and additional experts will be consulted as new occupations are identified.

3. **Establish dual-training committees for a PIPELINE project identified occupation in each targeted industry.**
   Four potential dual-training pilot projects have been identified; one from each of the Industry Councils. DLI will facilitate the coordination of at least one new dual-training and/or apprenticeship programs during the next six months. Dual-training committees are needed to ensure successful implementation of each dual-training program and include ongoing participation by employers, employees and education providers.

4. **Develop templates and implementation tools for new dual-training programs for all occupations identified through the PIPELINE project.**
   Templates and implementation tools based on the work of the PIPELINE project would include how-to guides and checklists for the development of a successful dual-training programs: recruiting and hiring; related instruction; on-the-job training programs; mentoring; program governance and sustainability.

5. **Create and execute a plan for dual-training outreach, exposure, and awareness.**
   The Industry Councils identified that outreach, early exposure and awareness about their industries and about dual-training opportunities is essential to build and expand dual-training in Minnesota. The PIPELINE Project recommends developing materials to market dual-training opportunities; identify and evaluate skills assessments and partner with key stakeholders including employers, labor and education to offer hands-on awareness events.

6. **Align dual-training delivery system to other workforce initiatives.**
   The Industry Councils acknowledged and explored many current workforce initiatives in these targeted industries. It is imperative that the PIPELINE Project continue to learn about, collaborate and align with statewide workforce development projects designed to enhance Minnesota's skilled labor force.

7. **Develop research and analysis tools to determine dual-training system costs and benefits.**
   The PIPELINE Project recommends additional research and analysis on the costs, return on investment and benefits of dual-training for employers, employees and the state.

8. **Explore providing financial support to make dual-training programs viable and sustainable for employers and employees.**
   The Industry Councils recommended the state explore possible incentive funds or seed grants for employers and dual-training employees or apprentices to assist in off-setting the initial costs associated with beginning a dual-training or apprenticeship program.

INTRODUCTION

During the 2014 session, the Minnesota legislature created the PIPELINE Project to explore an employment based workforce model centered on training employees through a system that has been successful in the United States and Europe for more than a century – apprenticeship.

By targeting four economic growth industry sectors with limited previous experience with Minnesota's apprenticeship system, this initiative strives to explore workforce development solutions in areas of economic demand and potential growth. The industries include: Advanced Manufacturing, Agriculture, Health Care Services, and Information Technology (IT).

Several long-term systemic issues related to workforce development were the impetus behind the Minnesota PIPELINE legislation. These workforce realities continue to guide the management of the PIPELINE project: jobs in high-growth sectors increasingly require complex knowledge, skills and abilities of its employees; and Minnesota has well documented issues with high rates of youth unemployment and college graduate under-employment. Therefore, the long-term project goals of the PIPELINE Project include enhancing the number of skilled workers in Minnesota's workforce through increasing dual-training and registered apprenticeship throughout Minnesota.

In developing the project plan, identifying participants and inventorying current workforce initiatives, DLI worked closely with staff members from a number of groups. Among them were the Minnesota Chamber of Commerce, Minnesota AFL-CIO, the Department of Employment of Economic Development and Minnesota Colleges and Universities. The chief legislative sponsors, Sen. Teri Bonoff and Rep. Kim Norton, were also very involved in the project planning and implementation. Sen. David Senjem and Sen. Carla Nelson also took part.

Additionally, Mayo Clinic, Hennepin Technical College and South Central College generously hosted Industry Council meetings.

The findings and recommendations in this report are developed directly from the information that was learned from the representatives of each industry during the 12 Industry Council meetings and multiple employer information gathering sessions.

PIPELINE PROJECT PURPOSE

The PIPELINE Project was developed to enhance the skilled workforce in Minnesota by being a catalyst for expanding the dual-training system with the voluntary participation from industry leaders. The legislation identifies several project outcomes:

- Establishment of competency standards for entry level and at least two additional higher skill levels in each industry.
- Verification of competency standards and skill levels and their transferability by representatives of each respective industry.
- Models of ways for Minnesota educational institutions to engage in providing education and training to meet the competency standards established.
- Participation from the identified industry sectors.
- By Jan. 15, 2015, report to the legislative committees with jurisdiction over jobs on the progress and success, including outcomes, of the initiatives in this section and recommendations on occupations.

INDUSTRY COUNCILS

The PIPELINE Project began by identifying and inviting industry representatives from employers, labor and education providers to participate in Industry Council discussions.

DLI convened 12 meetings, three for each of the Industry Councils in August, October and November 2014.

The Industry Councils have worked to:

- understand current and near-future workforce needs in each industry,
- explore existing workforce initiatives, better understand dual-training and apprenticeship programs in each industry,
- identify occupations in each industry that have the potential to be developed through dual-training or apprenticeship programs,
- begin to establish competency standard models for one entry-level and at least two higher-skill occupations in each industry, and
- gather recommendations from each Industry Council about how to implement dual-training in each industry.

During the first meeting, each Industry Council discussed the purposes of the PIPELINE Project, began to identify the needs of each industry and explored high-demand and hard-to-fill occupations.

Following these meetings, industry specific surveys were distributed to further clarify the occupations most easily supported by dual-training or apprenticeship, as well as validate industry-specific personal effectiveness competencies, academic competencies, workplace competencies, and industry-wide competencies.

During the second meeting, the Industry Council's identified three or four occupations to begin exploration of dual-training delivery models.

These competencies were based on current dual-training, education and apprenticeship programs developed by the U.S. Department of Labor amd were presented by Industry Council members.

The final meetings of the Industry Councils identified recommendations for moving forward with competency standard development and potential next steps in dual-training delivery.

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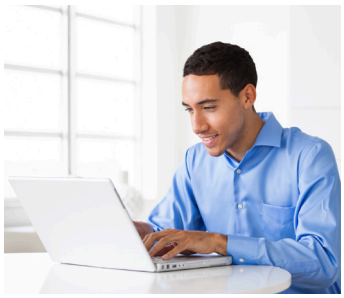


INFORMATION TECHNOLOGY

DUAL-TRAINING AND REGISTERED APPRENTICESHIP

Registered apprenticeship is the most utilized dual-training system in the United States and in Minnesota.

The Minnesota Department of Labor and Industry is recognized by the U.S. Department of Labor as the state apprenticeship authority with the responsibility to develop, administer and oversee registered apprenticeship programs.

In December 2014, Minnesota had 310 apprentice sponsors and more than 8,800 active apprentices. Currently, approximately 80 percent of registered apprenticeships in Minnesota are in the construction trades.

Dual-training, including registered apprenticeship, has many advantages for employers and workers. These employment-based training models provide living wages and benefits for employees while they are learning new skills and advancing their careers.

An individual entering a dual-training program can be hired into the position as a dual-trainee or apprentice, then through on-the-job training and related instruction the employee can gain knowledge and skills needed to be an expert worker in their chosen occupation.

The core components of dual-training and registered apprenticeship are the same:

- employment,
- on-the-job training and mentorship, and
- related instruction.

The Industry Councils identified that the terms "dual-training" and "apprenticeship" have been interchanged and often confused.

Registered apprenticeship is a formal system of delivering dual-training. DLI approves apprenticeship program standards that include the program's administrative rules, and the required related instruction and the detailed work-processes for on-the job training for each occupation in the apprenticeship program.

The standards also include a progressive wage schedule so the apprentice earns more as their skills develop. DLI also approves registered apprenticeship agreements between employers and apprentices and issues nationally recognized credentials upon the successful completion of an apprenticeship program.

Dual training and registered apprenticeship programs can be developed in a variety of ways including:

- single employer with a customized training provider,
- multi-employer and labor joint programs,
- education driven with multi-employer participation,
- industry association with multi-employer participation.

Delivery options for dual-training and registered apprenticeship are also flexible and designed to meet employer's needs:

- Time-based programs require a specified number of hours the dual-training employee or apprentice spends in on-the-job training and related classroom instruction.
- Competency based programs have assessments that must be passed to ensure mastery of specific skills.
- Hybrid programs require a combination of the time-based and competency-based approaches.

DUAL-TRAINING	REGISTERED APPRENTICESHIP
Dual-trainee is an employee of participating employer	Registered apprentice is employee of sponsoring employer
Work process – A description of on-the-job training	Work process – 2,000 hours each year or equivalent
Related technical instruction – A description of the coursework the dual-trainee will complete	Related technical instruction– 144 hours each year or equivalent
	Safety training – 50 hours each year
	Progressive wage schedule
	State issued completion certificate

COMPETENCY STANDARDS MODELS

The PIPELINE Project has developed competency standard models to help depict occupation specific dual-training competencies.

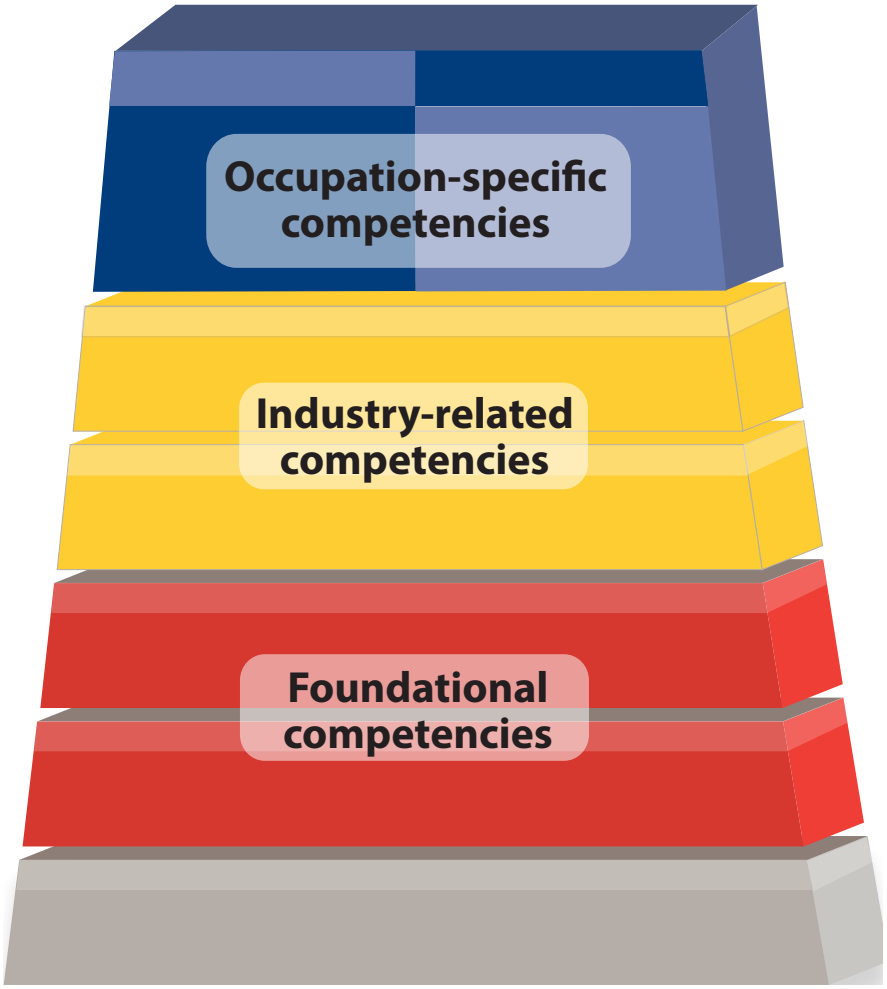
These models help to promote an understanding of the function of competency standards in general and to illustrate the knowledge, skills and abilities required for each specific occupation.

The PIPELINE competency standards models are modified versions of competency models developed by the U.S. Department of Labor.

These models are depicted as pyramids. The base of the competency pyramid includes the most general knowledge and skills. Greater specialization continues as the pyramid rises through industry, occupation and finally employer-specific knowledge skills and abilities are found at the top of the pyramid.

Models for the PIPELINE occupations were pulled from the Competency Model Clearinghouse for review, discussion and validation by Minnesota industry leaders (www.careeronestop.org/CompetencyModel).

Initial competency standards have been drafted for each identified occupation, but nine occupations require further analysis. All occupation competency standards models must be validated by industry subject matter experts. Competency standards for PIPELINE identified occupations can be found in the Appendix.



PROJECT FINDINGS

PIPELINE PROJECT FINDINGS	INDUSTRY COUNCIL IDEAS
There is a high demand for employees in entry, mid and advanced level occupations in Advanced Manufacturing, Agriculture, Information Technology, and Health Care. Services.	• Create innovative recruiting tools and models; for example girl high school clubs, veterans' programs, and prison-to-work programs that aim to recruit more diverse audiences into industry. • Develop a talent pipeline through dual-training programs by building an infrastructure for continuous improvement of the current workforce. • Identify opportunities for program variability based on industry sub-sectors and geographic differences in Minnesota. • Support and expand current innovative training programs throughout the state. • Establish tools to identify the transferability of skills from unrelated occupations. • Seek opportunities to develop career pathways that will support employees entering the profession and moving between occupations. • Focus recruitment on projects aiming to hire people of color, women, and veterans.
Employers and industry representatives support competency-based workforce development systems, and they recognize and value their role in identifying and validating competencies for identified occupations.	• Continue to develop occupational competency standards for the careers selected by each Industry Council. • Validate PIPELINE Project occupational competency standards with industry experts. • Identify means of analyzing and documenting transferable skills. • Lead the Minnesota effort in defining each selected occupation identified by the PIPELINE Industry Councils thus creating standardized language throughout the state. • Implement one to four new dual-training programs with newly established tools and occupational competency standards. • Implement new dual-training programs in partnership with Industry Councils.
Given sufficient resources, government has the ability to provide the infrastructure, tools, and assistance to help employers develop and manage dual-training programs.	• Build a system to track on-the-job-training (OJT) and related instruction progress. • Assist and support employers with the processes and structure related to establishing dual-training or apprenticeship. • Create dual-training templates and program design options to facilitate quick and easy implementation of new dual-training programs in each industry. • Develop a tool kit to include resources for establishing dual-training programs and training for employers, mentors, and educators.

PROJECT FINDINGS

PIPELINE PROJECT FINDINGS	INDUSTRY COUNCIL IDEAS
(continued ...)	• Establish seed funding to assist employers and dual-trainee employees or apprentices in participating in new dual-training and/or apprenticeship programs in each of the four industries. • Create incentives for employers and dual-training employees. • Target existing state and innovative funding streams to finance PIPELINE Project next steps.
Education and organized labor can assist employers with early exposure, hiring, recruiting and related instruction for dual-training programs.	• Science, Technology, Engineering and Math (STEM) preparation is aligned to workforce demand. • Support career courses being included in K-12 standards. • Ensure classrooms have relevant technology. • Develop programs to foster industry skills; exposure programs for faculty and initiatives to bring industry experts into classrooms. • Design programs to foster creativity and innovation. • Identify or develop aptitude assessments specific to each occupation. • Ensure prospective candidates are aware of high-level of commitment need to successfully complete dual-training.
It is essential to promote awareness about high-growth and high-demand industries and dual-training opportunities in these fields, especially to young people, people of color, women and veterans.	• Continue to provide education about dual-training and apprenticeship definitions, processes and benefits. • Outreach to increase awareness on specific industry and dual-training opportunities to all groups in Minnesota. • Develop programs to foster career exploration. • Create industry specific marketing material to promote PIPELINE occupations and dual-training “tool-kits” to support employers, dual-training employees or apprentices, and early exposure initiatives. • Develop a marketing plan to expose youth and adults to hands-on industry specific career exploration opportunities through summer camps, semester programs, cooperatives, internships, etc. • Create marketing and communication plan to disseminate dual-training information and templates to employers; the goal is to educate more employers on this workforce model.
Long-term and widespread employer engagement in dual-training systems requires an ongoing analysis of the costs and impact on productivity, revenue and employee tenure.	• Identify how dual-training programs will increase employee retention. • Identify how to measure the return on investment for employers engaged in dual-training programs. • Research and document the cost of dual-training versus other hiring and education methods within the industry.

ADVANCED MANUFACTURING OUTCOMES

ADVANCED MANUFACTURING

ABOUT THE INDUSTRY

Minnesota had more than 307,200 manufacturing jobs statewide in 2013, which is 13 percent of all private-sector employment.

Manufacturing has the second-largest total payroll of any private-sector industry at $18.3 billion annually, and manufacturing pays an average annual wage of $59,565. That amount is 21 percent higher than the average wage in all other industries.

In addition, every manufacturing job also supports another 1.7 jobs in other segments of Minnesota's economy – or about 519,000 additional jobs – meaning in all, manufacturing accounts for about 826,000 jobs, or 31 percent of all jobs statewide.

Manufacturing also contributes $43.7 billion to the state economy and accounts for 16 percent of Minnesota's gross domestic product. Minnesota companies sold nearly $20 billion in manufactured products in foreign markets, and more than 8,600 companies had export sales in 2013.

Advance Manufacturing is the PIPELINE industry that currently has the strongest apprenticeship infrastructure in the state, including 20 registered apprenticeship programs in manufacturing and 125 current manufacturing apprentices.

DLI has also partnered on a Customized Training Pilot Program (CTPP) in advanced manufacturing industry with DEED. The program tracks participant training and program completion in partnership with Alexandria Technical and Community College, Hennepin Technical College, Central Lakes College and Century College.

The CTPP program has 143 participants, 22 employers and includes 73 signed employer agreements. A full description is available in Appendix D.

ADVANCED MANUFACTURING INDUSTRY COUNCIL

Seventy-five people participated in the Advanced Manufacturing Industry Council meetings.

- 27 members of industry and industry associations
- 14 education representatives
- Seven labor and labor/education representatives
- 27 government, legislative and other representatives

Council membership includes employer representation from food, medical device, precision, and custom manufacturing sectors. Council members and additional representatives are listed in Appendix C.

The first Advanced Manufacturing Industry Council meeting was conducted Aug. 12, 2014, at the Department of Labor and Industry. The purpose of the PIPELINE Project and the vision for success were shared with the Council.

Industry Council member Kim Arrigoni, Board Officer at Haberman Machine, presented the business case for the advance manufacturing sector to begin investigating non-traditional workforce development options like dual-training or apprenticeship models as solutions to workforce shortages in their industry. Richard Wagner, President of Dunwoody College of Technology, described the educational impact of dual-training and registered apprenticeship programs for employees, employers and the state. Using a facilitated process, the Council generated an inventory of abilities, knowledge and skills for high-demand advance manufacturing occupations; the occupations discussed at this meeting were used to generate a preliminary list of "apprenticeable" advance manufacturing occupations.

After the first Industry Council meeting, the list of high-demand occupations was cross-referenced with DEED labor-market data, MnSCU listening sessions results and Wanted Analytics data, a Web-supported database that provides current and past job openings in the state.

A survey was designed to identify the most "apprenticeable" advance manufacturing occupations. More than 100 industry representatives completed the survey selecting six of the most "apprenticeable" industry occupations. The survey also served to validate industry specific competencies related to personal effectiveness, academic, workplace, and industry-wide technical skills based on the PIPELINE Competency Standards Models adopted the U.S. DOL Competency Models.

ADVANCED MANUFACTURING OUTCOMES

South Central College hosted the second Advance Manufacturing Industry Council meeting on Oct. 13, 2014. Jan Doebbert, Vice-President of Academic Affairs and Bob Defries, Dean of Customized Training both of Alexandria Technical and Community College discussed its registered apprenticeship program; opportunities, challenges and lessons learned. Dr. Annette Parker, President of South Central College, presented on dual-training programs and models throughout the United States, and the current U.S. DOL grant awarded to South Central College focusing on expanding dual-training throughout Minnesota.

The Industry Council identified four occupations for a dual-training focus, including the development of competency standards.

The final Advance Manufacturing Industry Council meeting was hosted by DLI on Nov. 14, 2014. The Industry Council made recommendations to move forward with occupational competency standard development and potential next steps to increase dual-training delivery in advanced manufacturing.

Occupations identified by the Advanced Manufacturing Industry Council for PIPELINE competency modeling and dual-training planning are:

- **CNC Operator/machinist**
- **Maintenance and repair worker**
- **Mechatronics technician**
- **Metal fabricators – welders, cutters solderers, brazers**

ADVANCED MANUFACTURING RECOMMENDATIONS

Recommendations specific to the Advanced Manufacturing industry are categorized by area of need:

1. **Early exposure**
   Industry Council members strongly support creating a marketing and branding campaign to highlight career opportunities in advanced manufacturing, and to promote dual-training options in this industry sector. They suggest providing youth and adults greater awareness of this industry by linking career awareness initiatives and self-awareness assessments related to an individual's interest and aptitude. Other efforts to increasing awareness and understanding of this industry include:

   - developing more youth and adult advance manufacturing camps,
   - creating opportunities for hands-on experience in advanced manufacturing occupation, and
   - establishing mentoring programs linking industry experts with youth and/or adults interested in learning more about advanced manufacturing.

   Council members believe that strong mentors both prior to employment and during dual-training will strengthen recruitment and career advancement in advanced manufacturing. This includes training mentors about K-20 pathways and how to mentor strong workplace skills.

   Employers expressed a preference that programs be frontloaded with pre-employment training to ensure success as individuals enter the work setting. Many employers within the manufacturing industry currently use temp-to–hire or third party employment services to recruit and hire employees. Employees receive some general training through these employment services, followed by on-the-job training at the manufacturer.

   The Industry Council suggests focusing outreach efforts to under-represented groups in this industry, such as people

of color, women and veterans. In addition, the Industry Council believes it is critical to educate parents, school counselors, and teachers about the opportunities available in this industry.

The Advanced Manufacturing industry has been and continues to be dedicated to early exposure initiatives aimed at highlighting occupational opportunities and pathways in this industry. The Industry Council encourages the PIPELINE Project to link and to partner with the other advanced manufacturing initiatives and projects throughout the state to maximize impact and effectiveness.

2. **Hiring and recruiting**

Council members said that employers generally try to hire experienced operators and machinists to ensure efficiency and quality. Dual-training could be an alternative means of developing a talent pipeline and building the infrastructure for continuous improvement of the current workforce. The Industry Council also suggested the idea of hiring individuals as interns first to determine the employee's commitment and interest in the specific occupation; then converting the employee to an apprentice at the end of a successful internship experience.

The Industry Council recommends a coordinated recruitment initiative for advanced manufacturing by region and statewide. For example, it is likely that there is untapped opportunity to recruit and hire individuals who do not self-identify their skills or interests as aligning with careers in advanced manufacturing. Skills from unrelated occupations or the military could be identified as transferable to the industry; resulting in effective recruiting strategies and streamlined training. The aim of cross-industry partnerships is to reach a diverse untapped group of potential advanced manufacturing application; veterans, women, high school youth, transferable, but unrelated skilled workers, individuals in corrections facilities, persons with disabilities, people of color, and low-income communities.

3. **Skills and training**

The breadth of knowledge and skill needs within advanced manufacturing is significant. Council members identified skill needs such as stamping, blue print reading, and running a lathe, or more general needs such as efficiency, quality assurance, and flexibility.

Additionally, a mix of skills is needed within each sub-sectors of the industry. For example, medical manufacturing requires machinists, injection molding operators, regulatory specialists, sterilizations technicians, etc. As the advanced manufacturing industry continues to automate, different levels of skill are needed such as machine operators with programming abilities and knowledge of electrical applications– a technician and an engineer in one person.

Continuous improvements skills are needed to ensure employers remain competitive in a world economy. The council suggested a multi-employer and/or multi-function supply chain work rotation might maximize employee development. Additionally, national skills standards groups may be a resource for competencies mapping in advanced manufacturing.

The Industry Council recognizes the various drivers and structures available for delivering on-the-job training and related instruction for dual-training programs. They continue to seek assistance with developing dual-training and apprenticeship standards, and setting up the dual-training system framework.

Industry Council members explored the types of infrastructure this industry needs to support dual-training. The development of a "tool kit" for associations and employers new to dual-training emerged as a Council recommendation. The tools needed in the tool kit include training for new mentors, templates for competency mapping and program development, templates for related instruction curriculum development, and train-the trainer programs for program sponsors, supervisors, mentors, and faculty.

ADVANCED MANUFACTURING OUTCOMES

4. Recommended next steps

- Validate occupational competency standards; identify means of analyzing and documenting transferable skills.
- Continue to provide education about dual-training and apprenticeship definitions, processes and benefits.
- Outreach to increase awareness on Advanced Manufacturing industry and dual-training opportunities throughout Minnesota.
- Assist and support employers with the processes and structure related to establishing dual-training or apprenticeship.
- Establish seed funding to assist employers and dual-trainee employees or apprentices in initiating new dual-training and/or apprenticeship programs in advance manufacturing.
- Create dual-training templates and program design options to facilitate quick and easy implementation of new dual-training programs in advance manufacturing throughout the state; ensuring that they are cross-functional and represent the industry as a whole.
- Implement one new dual-training program with newly established tools and occupational competency standards.
- Create industry specific marketing material to promote the advance manufacturing occupations and dual-training "tool-kits" to support employers, dual-training employees or apprentices, and early exposure initiatives.
- Lead the Minnesota effort in defining advanced manufacturing and defining each selected advance manufacturing occupation identified by this Industry Council thus creating standardized language throughout the state.
- Create innovative recruiting tools and models; for example girl high school clubs, veterans' programs, and prison to work programs that aim to recruit more diverse audiences into this industry.
- Negotiate statewide agreements with MSSC, NIMS, PMMI, and AWS to ensure national credentialing standard are available to employers and employees throughout Minnesota.
- Identify opportunities for program variability based on industry sub-sectors and geographic differences in Minnesota.
- Perform a cost analysis of dual-training versus other methods of hiring and employee training and education.

AGRICULTURE OUTCOMES

AGRICULTURE

ABOUT THE INDUSTRY

A 2010 study by the Minnesota Department of Agriculture estimated the total economic impact of agriculture in the state at $23.3 billion and the agricultural economy has improved greatly since then. The same study shows the total employment impact to be 149,384 jobs, which includes direct employment of 98,006.

According to the 2012 Census of Agriculture, Minnesota is home to more than 74,500 farms covering just more than 26 million acres, which is nearly half of the state's total land area. The market value of agricultural products sold in 2012 climbed to $21.3 billion, a 61 percent increase since 2007.

Minnesota ranks fouth in the United States for total market value of products sold, including fourth in the value of crops and seventh in the value of livestock products. Minnesota is first in the number of turkeys, third in hogs and pigs, third in soybeans, third in grains and oilseeds, fourth in corn for grain, and seventh in milk from cows. It ranks in the top 15 in several other crop and livestock categories, including poultry and egg production, cattle and calves and vegetables.

Agriculture has several national apprenticeship programs, yet no registered apprenticeship programs are active in Minnesota. Many of the positions within the industry are new, emerging or experiencing significant technological shifts.

AGRICULTURAL INDUSTRY COUNCIL

Fifty-two people participated in the Agriculture Industry Council meetings.

- 19 members of industry and industry associations
- Nine education representatives
- Four labor and labor/education representatives
- 20 government, legislative and other representatives

Council members and additional representatives are listed in Appendix F.

The first Agriculture Industry Council meeting was conducted Aug.14, 2014 at the Department of Labor and Industry. The purpose of the PIPELINE Project and the vision for success were shared with the Council.

Industry Council member Dr. Brian Buhr, Dean of University of Minnesota's College of Food, Agriculture and Natural Resource Sciences (CFAN), framed the issues facing the agriculture industry in Minnesota, especially related to workforce shortages statewide.

Current competency standards training models used in the United States and Europe were outlined. Through a facilitated process, the Council generated an inventory of abilities, knowledge and skills for high demand agriculture occupations; the occupations discussed at this meeting were used to generate a preliminary list of "apprenticeable" agriculture occupations.

After the first Industry Council meeting, the list of high-demand occupations was cross-referenced with DEED labor-market data, MnSCU listening sessions results and Wanted Analytics data. A survey was designed to identify the most "apprenticeable" agriculture occupations. The survey also served to validate industry specific competencies related to personal effectiveness, academic, workplace, and industry-wide technical skills based on the PIPELINE Competency Standards Models adapted from the U.S. DOL Competency Models in other industries, as agriculture models had not be developed prior to the PIPELINE Project.

The Department of Labor and Industry hosted the second Agriculture Industry Council meeting on Oct. 3, 2014. The meeting was dedicated to discussion and selection of three agriculture PIPELINE occupations.

Industry Council members were asked to identify industry experts in each of the selected agriculture PIPELINE occupations.

The final Agriculture Industry Council Meeting was hosted by DLI on Nov. 12, 2014. The Industry Council identified recommendations for moving forward with occupational competency standard development and potential next steps to increase dual-training delivery in agriculture.

AGRICULTURE OUTCOMES

Occupations identified by the Agriculture Industry Council for PIPELINE competency modeling and dual-training planning are:

- **Agronomist**
- **Herd manager**
- **Skilled mechanic (agriculture)**

Full descriptions of these occupations are available in Appendix G.

AGRICULTURE RECOMMENDATIONS

Recommendations specific to the Agricultural industry are categorized by area of need:

1. **Early exposure**
   While there are currently no registered apprenticeship programs in Minnesota, the agriculture Industry Council demonstrated a high level of interest and support for dual-training and apprenticeship. Agriculture is experiencing significant structural shifts in technology changes; resulting in emerging professions and potential opportunities to develop strong career pathways within the industry. Exposure and increased awareness to agriculture occupations is critical, especially for Minnesotans in suburban and urban locations who may have little understanding of this industry. Council members think it is important to promote greater awareness about "where Minnesota's food comes from." Hands-on experiences are important ways for individuals to assess their interest, aptitude, and suitability to professions within the industry. Council members believe that career exploration opportunities need to be directed at K-12 students, which requires providing training to support agriculture, food and natural resources instructors to begin this early career exploration process. Further, students need an early understanding of demand for strong Science, Technology, Engineering and Math (STEM) in agriculture as a foundation to career mobility within the industry.

2. **Hiring and recruiting**
   The industry needs all levels of workers, including leaders, sales people, scientists, herd managers, financial workers, etc. A background or understanding of agriculture, including hands-on experience is beneficial in all of these occupations and more. Industry members anticipate a wave of retirements. This, compounded by industry growth, is resulting in significant concerns of workforce shortages.

   Hiring is currently employer dependent. Industry Council members confirm that hiring is done at the entry-level with the expectation that trained employees will advance to manager roles. While current practices have a limited ability to meet the needs for some types of agriculture employees, it does not ensure the development of high-level managers and scientists. Industry Council members reinforce the importance of understanding the geographical recruitment and hiring needs and practices throughout the industry and state.

3. **Skills and training**
   Agriculture is a multiple dimension industry. This sector has experienced significant technological shift in its operational practices. Employees need knowledge of power diesel, electrical circuits, plumbing, hydraulic systems, computer technology, reading technical specifications and instructions, metal fabrication, building construction, etc. Equipment that historically was manually controlled is now electronically controlled and wireless technology is common. Employees need a higher level of technological proficiency than in the past, but this does not lessen the need for manual skills. Technicians need to be highly skilled in a range of areas, including: manual mechanics, electronics, emerging technology, manufacturer specific technology, and have a commercial driver's license. Animal

AGRICULTURE OUTCOMES

care professionals need these skills, as well as an understanding of nutrition, animal monitoring and care. Sub-sectors of the industry must also understand standards for organic farming, conservation and animal care.

The delivery of related instruction and on-the-job training are critical for this industry and must be reviewed regularly to ensure curriculum, equipment, and technology are relevant to the changing needs of the industry. Education must be flexible and reflect the seasonality of the agriculture industry. Production cycle creates periods of very high labor demand (i.e. hours of work) and periods of low labor demand. Many positions require long hours and/ or night shifts. Language and cultural skills, as well as people management skills are necessary and increasingly multi-lingual skills and cross-cultural experience is valued.

Industry council members suggest partnering with one or more of their strong industry associations as the appropriate means of developing dual-training, rather than employer-by employer. This industry prefers cross training initiatives with short and stackable credentials that could fit the flexibility needs of agriculture and train the trainer programs that assist employers with refining their on-the-job training techniques.

4. Recommended next steps

- Continue to develop occupational competency standards for the careers selected by the Industry Council.
- Launch new dual-training programs in partnership with an agriculture Industry Council.
- Develop a marketing plan to exposure youth and adults to hands-on agriculture career exploration opportunities through summer camps, semester programs, cooperatives, internships, etc.
- Identify feasibility having regional dual-training coordinators throughout the state.
- Align agriculture education and supports to meet the needs of the industry in Minnesota.
- Survey current recruitment strategies for selected PIPELINE occupations throughout the state.
- Create urban agriculture recruitment programs for youth and adults.
- Identify how dual-training programs will increase employee retention.
- Identify how to measure the return on investment for employer having dual-training programs.
- Develop a tool kit to include resources for establishing dual-training programs and training for employers, mentors, and educators.

HEALTH CARE SERVICES OUTCOMES

HEALTH CARE SERVICES

ABOUT THE INDUSTRY

With more than 445,000 jobs at more than 14,000 establishments, Health Care and Social Assistance is the largest employing industry in Minnesota. The state gained a total of about 114,000 net new jobs from 2003 to 2013, while health care and social assistance added almost 94,500 net new jobs; accounting for 83 percent of the net job growth.

Health care occupations are projected to gain more than 27,500 new jobs in the next ten years, but will also need new workers to fill nearly 34,500 replacement openings due to retirements or other existing workers leaving the labor force. According to DEED's Employment Outlook, the state of Minnesota will have 62,220 total openings in STEM Health Care occupations from 2012 to 2022.

There are several significant health care services initiatives in Minnesota aimed at serving the industry's workforce needs. Notable examples include: Blue Ribbon Commission on the University of Minnesota Medical School, Foreign Trained Immigrant Physicians Task Force, Legislative Healthcare Workforce Commission, Mental Health Workforce Development Plan, Itasca Project, and NGA Healthforce Workforce Policy Academy.

The industry has long fostered employer-education partnerships through clinical rotations, residencies and other forms of internships.

Minnesota has one registered apprenticeship program:
The Health Support Specialist registered apprenticeship program, which was developed by Leading Age Minnesota. The program currently has eight employer sponsors, including:

- Good Shepard Lutheran Home
- Good Shepard Lutheran Services
- Oak Hill Living Center
- Three Links Care Center
- Avera Morningside Heights
- Benedictine Health Systems
- Benedictine Living Community
- Caledonia Care and Rehab

There are currently 38 active Health Services Specialist apprentices in Minnesota, 16 apprentices have completed the program.

HEALTH CARE SERVICES INDUSTRY COUNCIL

Fifty-seven people participated in the Health Care Services Industry Council meetings.

- 19 members of industry and industry associations
- 11 education representatives
- six labor and labor/ education representatives
- 21 government, legislative and other representatives

Industry Council participants are listed in Appendix H.

The first Health Care Service Industry Council meeting was conducted Aug. 15, 2014, at the Department of Labor and Industry. The purpose of the PIPELINE Project and the vision for success were shared with the Council.

Industry Council members Bethany Krom, Assistant Dean at Mayo School of Health Sciences and Adam Sumala, Vice-President of Membership and Strategic Affiliations at Leading Age Minnesota (formerly Aging Service of Minnesota) framed the PIPELINE project related to the Minnesota Healthcare Services sector. Through a facilitated process the Council generated an inventory of abilities, knowledge, and skills for high demand Health Care Services occupations; the occupations discussed at this meeting were used to generate a preliminary list of "apprenticeable" health care services occupations.

After the first Industry Council meeting, the list of high-demand occupations was cross-referenced with DEED labor-market data, MnSCU listening sessions results and Wanted Analytics data. A survey was designed to identify the most "apprenticeable" advance manufacturing occupations. Several Industry Council members reached out to PIPELINE Project staff members to discuss the uniqueness of the health care services industry. Some shared that this is a highly regulated and licensed non-profit industry, with often limited control of some of the legal, licensure and financial aspects of training and

HEALTH CARE SERVICES OUTCOMES

development of employees. The survey and Industry Council membership conversations also served to validate industry specific specific competencies related to personal effectiveness, academic, workplace, and industry-wide technical skills based on the PIPELINE Competency Standards Models adapted from the U.S. DOL Competency Models.

Mayo Health Systems in Rochester hosted the second Healthcare Services Industry Council meeting on Oct. 1, 2014. Industry Council member Sally Nadeau, Communications Manager at Leading Age Minnesota (formerly Aging Service of Minnesota), discussed its registered apprenticeship program; opportunities, challenges and lessons learned.

The Industry Council selected four occupations for a dual-training focus, including the development of competency standards. Industry Council members requested the PIPELINE Project support other important initiatives in the Health Care Services sector, especially related to nursing professionals.

The final Health Care Services Industry Council meeting was hosted by DLI on Nov. 7, 2014. The industry council identified recommendations for moving forward with occupational competency standard development and potential next steps to increase dual-training delivery in Health Care Services.

Occupations identified for the Health Care Services Council for PIPELINE competency modeling and dual training planning are:

- **Health information technician**
- **Health support specialist (current registered apprenticeship)**
- **Medical scribe**
- **Psychiatric technician/mental health technician**

Full descriptions of these occupations are available in Appendix I.

HEALTH CARE SERVICES OUTCOMES

HEALTH CARE SERVICES RECOMMENDATIONS

Recommendations specific to the Health Care Services industry are categorized by area of need:

1. **Early exposure**

   Many students and youth are familiar with some professions within the healthcare industry – especially the idea of being a doctor or a nurse. However, enhanced career education and counseling is needed to provide awareness about the very broad range of occupations within the sector. Even some students that are interested are unaware of the nature of health care work and don't always have realistic expectations about the necessity of being academically prepared for a career in health care. Students who do not take sufficient science and math in high school must "play catch-up" in college prior to entering their chosen field of study. Industry council members want to expand many of the hands-on career exploration opportunities already available in Minnesota. Increasing outreach efforts to high school counselors, teachers and parents was also identified as essential to promoting lesser known health care professions.

2. **Hiring and recruiting**

   Health care is in the midst of significant structural and technological changes. Council members indicate that the industry is also transitioning from a model of acute care to community care. Further, demographic shifts are causing changes in health care workforce demand. There is a need for more specialists in geriatric, hospice, palliative care, and chronic disease management care. A high proportion of some professions, especially nurses, are nearing retirement age.

   The Industry Council shared that health care services demand varies by subsector within the industry and geographically across Minnesota. Long-term care services face workforce challenges as the pay structure is less than in acute care and other health care settings. Labor demand appears especially critical in rural areas. There is high turnover in direct care positions, including nursing assistants, and practical and professional nursing. As turnover occurs, the industry may lose prospective employees. Occupations exist in silos with little opportunity to move between and among professions.

   Financial issues are a significant concern to this industry. Council members wanted to learn more about the return-on-investment of dual-training initiatives, particularly at a time when the industry is feeling pinched by continued cuts and pressure to reduce cost.

3. **Skills and training**

   Health care services employees must have strong verbal and writing skills. Strong candidates are detail oriented with good critical thinking skills, as well as knowledgeable about biology and medicine. The role of technology is growing in all areas of health care services. Workers have to be more technologically proficient in providing care, documenting care and communicating with patients, members of the care team and other professionals. Employees are also expected to have a greater understanding of health care finance, including reimbursement practices.

   The long-term partnership between education and health care addresses many of the skill needs of the profession, yet as the approach to care changes, new professions are emerging in mental health, in community care and to support industry technology. Industry Council members recognize the benefit of standardizing curriculum within health care occupations both at academic institutions and on-the-job-training sites. They believe Minnesota's health care education should be aligned with the highest national standards and be flexible in its delivery.

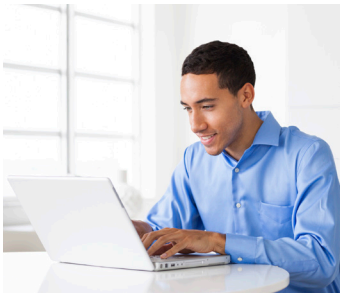
   Health care services professionals have a rich history of mentorship through formalized relationships, such as residency and clinical placements. Leaders in health care services would like to expand training for preceptors and industry mentors. Then, build on this training model for occupations not traditionally linked to this form of training.

HEALTH CARE SERVICES OUTCOMES

4. Recommended next steps

- Complete the occupational competency standards and validate with industry experts.
- Implement dual-training program that supports emerging industry professions, changing care models and technology.
- Establish seed funding to assist employers and dual-trainee employees or apprentices in initiating new dual-training and/or apprenticeship programs in health care services.
- Research and document the cost of dual-training versus other hiring and education methods within the industry.
- Seek opportunities to develop career pathways that will support employees entering the profession and moving between occupations.
- Identify opportunities for program variability based on industry sub-sectors and geographic differences in Minnesota.
- Create marketing and communication plan disseminate to disseminate dual-training information and templates to employers; the goal is to educate more employers about this workforce model.
- Host follow-up Industry Council meeting to report about results and next steps for dual-training.
- Create dual-training templates and program design options to facilitate quick and easy implementation of new dual-training programs in healthcare services in emergent occupations.
- Recognize and acknowledge the healthcare services sector is unique due to its financial structure, licensure requirements and state/federal regulations.
- Recognize the need for healthcare services to have state or federal funds to further to develop and fund dual-training programs throughout the industry.

INFORMATION TECHNOLOGY OUTCOMES



INFORMATION TECHNOLOGY

ABOUT THE INDUSTRY

The Information Technology (IT) field has grown in importance in the state of Minnesota, now accounting for more than 88,600 jobs, according to employment estimates from DEED.

The state continues to see steady job growth in IT, with both short- and long-term gains at software publishers; data processing, hosting and related services; and other information services, which includes Internet publishing, broadcasting and Web search portals.

Combined, these three industries increased more than 10 percent and now provide more than 19,000 jobs in the state. IT occupations are projected to gain more than 8,000 net new jobs through 2022 and will also provide 13,810 replacement openings for 22,140 total openings in the next decade.

There are currently no registered apprenticeships in Minnesota; however dual-training and apprenticeship are being explored by employers and related instruction providers.

Programs that combine formal education and on-the-job-training such as internships are common in this industry.

INFORMATION TECHNOLOGY INDUSTRY COUNCIL

Sixty-five people participated in the Information Technology Industry Council meetings.

- 30 members of industry or industry associations' representatives
- 12 education representatives
- Four labor and labor/education representatives
- 19 government, legislative and other
-

Council members and additional representatives are listed in Appendix K.

The first Information Industry (IT) Council meeting was conducted on Aug. 15, 2014, at the Department of Labor and Industry. The purpose of the PIPELINE Project and the vision for success were shared with the Council.

Margaret Anderson Kelliher, President and Chief Executive Officer of Minnesota High Tech Association, framed the workforce challenges that face the Minnesota Information Technology sector. Through a facilitated process the Council generated an inventory of abilities, knowledge, and skills for high demand IT occupations; the occupations discussed at this meeting were used to generate a preliminary list of "apprenticeable" occupations.

After the first Industry Council meeting, the list of high-demand occupations was cross-referenced with DEED labor-market data, MnSCU listening sessions results and Wanted Analytics data. A survey was designed to identify the most "apprenticeable" IT occupations. Several Industry Council members reached out to PIPELINE Project staff members to discuss the uniqueness of the IT industry. Specifically, the industry is project and consultative-based and serves as both an individual industry sector and a functional business area throughout organizations. The survey and Industry Council member conversations also served to validate industry specific competencies related to personal effectiveness, academic, workplace, and industry-wide technical skills based on the PIPELINE Competency Standards Models adapted from the U.S. DOL Competency Models.

Hennepin Technical College hosted the second Information Technology Industry Council meeting on Oct. 2, 2014. Industry Council member Brendan Nolan, Director of Business Development at Eagle Creek Software Services, discussed Eagle Creek Model of Addressing the IT Talent Supply Gap. The Industry Council selected four occupations for a dual-training focus, including the development of competency standards.

The final IT Industry Council meeting was hosted by DLI on Nov. 10, 2014. Industry Council member, Bruce Lindberg, Executive Director of Advanced IT Minnesota, discussed the new Fusion program, which pairs employer-endorsed students with employer partners to students, leading to workforce-ready employees upon graduation. This program is currently available at Metro State University and soon will be offered at Mankato State

INFORMATION TECHNOLOGY INDUSTRY

University. Industry Council member, Mark Hurburt, President of Prime Digital Academy (formerly Chief Strategy Officer at the Nerdery), outlined the newly established Prime Digital Academy's format of working directly with employers to re-engineer software development education to prioritize the capabilities newcomers needed to make immediate contributions. Their students learn modern technologies, real world methodology and relevant behavioral skills through hands-on, experiential learning. Finally, the Industry Council identified recommendations for moving forward with occupational competency standard development and potential next steps to increase dual-training delivery in Information Technology.

Occupations identified by the Information Technology Industry Council for PIPELINE competency modeling and dual training planning are:

- **Security analyst**
- **Web developer**
- **Software developer**
- **Service desk/front line support or computer user support specialist**

Full descriptions of these occupations are available in Appendix L.

INFORMATION TECHNOLOGY RECOMMENDATIONS

Recommendations specific to the Information Technology industry are categorized by area of need:

1. **Early exposure**

   The Information Technology instruction is offered in the secondary education system, yet varies considerably between districts and individual schools. Schools are increasingly using technology tools in the classroom, but may not provide instruction about how the technology works or how to develop tools for the technology. Parts of the IT industry maybe hidden because information technology occupations are imbedded in all industries. The proliferation of computing devises and their popularity among youth is an opportunity to engage student curiosity in how devices work and how to build programs that can add to the function of a device. The IT industry does have excellent examples of programs that are engaging youth and students, including "Coder Dojo," computing camps and technology based "meet ups." Ensuring a broader range of students has access and sufficient information to foster interest in these experiences remains a pressing need.

   Industry representatives call for earlier exposure for K-12 students to the industry. They believe it is especially important to create greater awareness for students in the 8th and 9th grade. This would both develop an understanding of the occupations and career paths within information technology and inform students about the need for an academic foundation to assist in being successful in IT. Council members believe that the opportunity to use the proliferation of cell phones, computers, games, and hand-held devices to create interest and exploration in how those devices work. Parents are recognized as essential in assisting young adult early career decisions. Therefore, parents need to be educated about the great career opportunities that are available in IT.

   Employers expressed interest in creating opportunities and incentives for IT professionals to work with K-20 teachers and faculty to ensure the curriculum and technology taught in schools is relevant to industry needs. Industry council members discussed the improtance of career counselors in the K-20 system. They believe these supportive service positions will be able to assist youth and adults in making more informed career decisions by working with students to develop individual career plans. IT Industry Council participants recognize the value of supporting schools and helping to strengthen IT resources as well as offer co-op education opportunities.

INFORMATION TECHNOLOGY INDUSTRY

2. Hiring and recruiting

IT is a broad and diverse industry that by its nature rests at the forefront of technology changes, many of which also lead to significant structural changes within the industry. While it is forecasted the current move to cloud based systems and storage will greatly diminish the need for some professions, others will undoubtedly emerge from this shift. Industry council employers indicate that there is a significant skills shortage in a wide number of occupations, including extreme shortages in some areas such as coding and software engineering. Employers also note there is little standardization for titles and hiring criteria across and between occupations. Employers often seek candidates with a four-year degree for positions that require a two-year degree. In addition, employers often require at least one-year work experience. Council members said this practice is a "hedge" against hiring under-prepared employees. Employers actively recruit students/ potential employees who have engaged in "real" work, including those with internships, work experience in college IT service offices, and hobbyists with programming or network building experience. Employers continue to want to recruit, hire and retain the best and the brightest; leading to increased competition for IT talent.

3. Skills and training

Most information technology occupations require a strong science, technology, engineering and math (STEM) foundation. Employers seek workers with broad technical knowledge, as well as specific software skills. Employees must demonstrate nimbleness and an ability to learn new and emerging technologies quickly and to transfer knowledge from one project, language or technology to the next. Process thinking and project management skills are highly sought because IT workers often build or maintain substantial infrastructure.

In addition to technology skills, employees need to have business skills, such as understanding workflow, budget and finance, and organizational theory. Employers are especially in need of employees with knowledge about how different forms of technology work together.

Council members are highly supportive of project based learning opportunities and understand classroom experiences cannot fully develop students for the industry. They encourage connecting teachers and instructors with industry through work experience. They also support creating more credit for prior learning options and occupational standards based on competency mastery. Lastly, employers acknowledge that increasing the speed and responsiveness in modifying and developing curriculum was critical to meeting the workforce needs of this industry.

INFORMATION TECHNOLOGY INDUSTRY

4. Recommended next steps

- Continue to develop occupational competency standards for the careers selected by the Industry Council.
- Identify an Information Technology employer to initiate a dual-training program in one of the Industry Council's selected occupations.
- Support and expand current innovative information technology training programs throughout the state.
- Assist and support employers with the processes and structure related to establishing dual-training or apprenticeship.
- Establish seed funding to assist employers and dual-trainee employees or apprentices in initiating new dual-training and/or apprenticeship programs in information technology occupations.
- Create dual-training tool kits that serve as a "turn-key resource" with templates and program design options to facilitate quick and easy implementation of new dual-training programs in information technology.
- Engage teachers, faculty and information technology experts with in this sector to develop project based curriculum and on-the-job experiential opportunities.
- Lead the Minnesota effort to standardize the definition of each selected information technology occupation identified by this Industry Council.
- Provide information and training sessions for employers, educators, mentors and others.
- Catalog titles and hiring practices for occupations and determine if standardization is a reasonable goal.

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