

North Dakota Workforce Development Needs Assessment and Gap Analysis

January 2017

Prepared for:

**North Dakota State Board of Higher Education
North Dakota University System
North Dakota Department of Public Instruction
North Dakota Higher Education Committee**

By:

Workforce Education Advisory Council

Contents

- From the Chairman 3
- Introduction 4
- General Information and Findings 6
 - Limitations of Information Gathering Processes 7
 - General Information 8
 - General Recommendations 13
- Industry Reports..... 17
 - Energy 18
 - Limitations and Caveats of the Findings 19
 - Comparison of Oil and Gas Companies in North Dakota 19
 - Energy Workforce Composition – 2016 19
 - Energy Findings and Recommendations 21
 - Findings 21
 - Recommendations 22
 - Information Technology..... 23
 - Information Gathering Methods..... 23
 - Limitations and Caveats of the Findings 23
 - Snapshot of Information Technology in North Dakota 23
 - Current Demographics 24
 - Anticipated Changes in Demand and Implications for Education/Competencies by 2021 26
 - Changes in Knowledge, Skills, and Abilities (KSA)/Competencies 28
 - Information Technology Findings and Recommendations 29
 - Findings 29
 - Recommendations 29
 - Manufacturing 31
 - Information Gathering Methods..... 31
 - Limitations and Caveats of the Findings 31
 - Snapshot of Manufacturing in North Dakota..... 31
 - Current Demographics 32
 - Anticipated Changes in Demand and Implications for Education/Competencies by 2021 34
 - Changes in Knowledge, Skills, and Abilities (KSA)/Competencies 34
 - Manufacturing Findings and Recommendations 35
 - Findings 35
 - Recommendations 35
 - Healthcare..... 36
 - Information Gathering Methods..... 36
 - Limitations and Caveats of the Findings 36
 - Snapshot of Healthcare in North Dakota 36
 - Current Demographics 37
 - Anticipated Changes in Demand and Implications for Education/Competencies by 2021 38
 - Changes in Knowledge, Skills, and Abilities (KSA)/Competencies 39
 - Healthcare Findings and Recommendations 41

Findings	41
Recommendations	41
Agriculture	42
Limitations and Caveats of the Findings	42
Snapshot of Agriculture in North Dakota.....	42
Sources.....	44
About FHI 360	45
Report Authors.....	45

From the Chairman

It is with great pride that we submit the following *North Dakota Workforce Development Needs Assessment and Gap Analysis*. The report focuses on four key industries that the Workforce Education Advisory Council (WEAC) believes will be significant drivers of North Dakota's economy in the future: Energy, Healthcare, Manufacturing, and Technology. Agriculture will also continue to be a significant contributor to North Dakota's economy in the future but, due to its unique workforce needs, was not included in this study.

The report was researched and compiled by FHI 360, a global consulting firm with vast experience in workforce development, and was funded through a generous grant by Hess Corporation, without whose support this study would not have been possible.

Primary research for the report was conducted by identifying a point of contact for each industry. Contacts were asked to participate in a 60-minute telephone interview to help identify industry trends and challenges. Contacts were then asked to provide a list of at least 35 names of industry colleagues who we could contact and ask to complete an electronic survey on workforce development needs and gaps. This research was then paired with available secondary research to provide a more comprehensive view of workforce needs by industry across North Dakota.

In some cases, survey participation was not as large as we would have liked in order to ensure statistical relevance. Because of this limitation, some of the findings contained in the report may not match findings from secondary data or data obtained from larger survey groups.

This first phase of primary research seeks to answer two questions: (1) where are we today?; and (2) what are our identifiable workforce needs going forward? Once we can answer those two questions, we can evaluate our findings against current state-funded programs.

Looking ahead, WEAC recommends evaluating current state-funded workforce development programs for program and cost effectiveness, and redundancy with other programs. At the same time, we recommend identifying which current state-funded workforce development programs can be utilized to address the workforce development needs and gaps identified in this report.

Because WEAC is sensitive to not becoming part of an already crowded field of workforce development programs, we recommend disbanding the group after the completion of primary research. We recommend utilizing Job Service North Dakota's Workforce Development Council to implement recommendations, and eliminate redundancy and waste in current programs.



Mark R. Anderson, Chairman
Workforce Education Advisory Council

Introduction

The Workforce Education Advisory Council (WEAC) was created to advise the State Board of Higher Education (SBHE) regarding the (1) skills and qualifications needed for workforce training, and (2) career and technical education programs offered at institutions under the control of the SBHE through Section 11 of Chapter 15–10 of the North Dakota Century Code. The mission of WEAC is:

To advise the State Board of Higher Education regarding the workforce needs of business and industry in North Dakota. These include the skills and qualifications required for a ready workforce as they relate to educational programs under the control of the Board.

With a focus on eliminating redundancy and maximizing return on investment, we will also provide an outside perspective on educational curriculum, development, delivery and assessment.ⁱ

The eleven members of WEAC represent the Department of Career and Technical Education, Job Service North Dakota, Department of Commerce, and eight members representing business and industry in the state. Members of WEAC include:

- Mark R. Anderson, President and CEO, Mainstream Investors, LLC
- Glenn Bosch, Executive Vice President, AVI Systems
- Gaylon Baker, Executive Vice President, Stark Development Corporation
- Jay Fisher, former Director of NDSU North Central Research Extension Center
- Cheri Giesen, Executive Director, Job Service N.D.
- Wayne Kutzer, Director and Executive Officer, N.D. Department of Career and Technical Education
- Marvin Lein, CEO, Mid Dakota Clinic
- Brent Lohnes (formerly Steve McNally) General Manager – North Dakota, Hess
- Guy Moos, CEO, Baker Boy
- Thomas D. Shorma, CEO, WCCO Belting
- Wayde Sick, Director of Workforce Development, N.D. Department of Commerce

In the summer of 2016, the Hess Corporation, a member of WEAC, commissioned FHI 360 to conduct information gathering, needs assessment, and gap analysis for the energy industry, with a particular focus on oil and gas, using Hess as a representative or proxy for the sector. The report was then shared with other members of WEAC. Through the generous support of the Hess Corporation, FHI 360 was then commissioned to create similar reports for healthcare, information technology, and manufacturing on behalf of WEAC. FHI 360 has also compiled publically available data on agriculture, which appear in this report; however, qualitative data were not collected on agriculture.

The following document summarizes this information gathering, needs assessment, and gap analysis. The report may be reviewed as a whole or reviewed independently by industry-sector or as cross-cutting recommendations.

Recommendations throughout the report were developed based on 1) information gathered during the process, including hard data and recommendations of interview and survey informants; 2) FHI 360's experience managing Succeed 2020, with federal agencies such as the U.S. Departments of Education and Labor, and with other states; and 3) conversations and recommendations from members of WEAC and representatives from industry and trade associations.

Again, we would like to thank the Hess Corporation for its leadership and financial contributions to this work.

ⁱ **Workforce Education Advisory Council.** Mission. Established at WEAC meeting. Informed by: North Dakota Century Code: Chapter 15–10 Section 11. The State Board of Higher Education. Accessed 5 December 2016. <http://www.legis.nd.gov/cencode/t15c10.pdf>

General Information and Findings

Limitations of Information Gathering Processes

FHI 360's process to develop this report can best be defined as information gathering, needs assessment, and gap analysis. A standard research methodology was not applied.

The information gathering process had its strengths and weaknesses as follows:

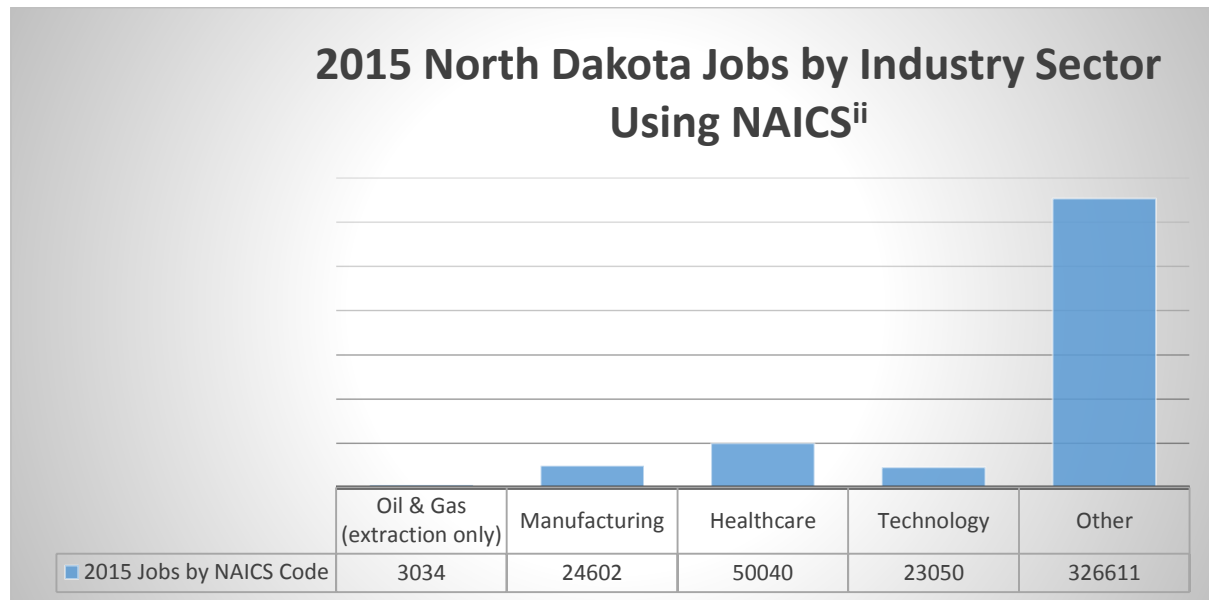
- Information gathering began by completing an in-depth analysis of the Hess Corporation and its needs as a proxy for the oil and gas industry. After the report was completed, other oil and gas companies were consulted to determine similarities and differences from Hess, as well as to confirm or question findings. Some elements of the energy industry may have been neglected; however, other elements were considered when reviewing publically available information, such as the Standard Occupational Classification (SOC) data. SOC data estimates the number of occupations, education requirements of those occupations, salary, and other data. This information comes from the Department of Commerce.
- Publically available data are presented in two time periods. NAICS information is presented as 2011–2015 as it demonstrates both growth and retraction of the economy. SOC information covered 2014–2024 because it is the newest available data.
- A similar process was used for the other three industries; however, there were several limitations including:
 - **Time:** FHI 360 completed the information gathering at Hess over several weeks during the summer of 2016 through interviews with staff and an in-depth analysis of staffing data. Due to time constraints, FHI 360 surveyed staff in the other industries.
 - **Access to data:** Hess provided FHI 360 detailed demographic data about staff. Manufacturing and healthcare did not have proxy businesses, so publicly available data were used. For information technology, a combination of publicly available data and state information technology department survey data was used.
 - **Survey contact lists and response rates:** Contact lists may not be comprehensive because they were limited to those organizations that have been involved in other state workforce activities. Further, response rates to surveys were low—between 21 and 40 percent, and many surveys were returned incomplete. Due to the low response rates, we consider all survey responses to be anecdotal and not generalizable.

While findings are limited, we made attempts to utilize multiple data sources and, when possible, consulted national and regional research to determine if findings were consistent with existing research and theory.

General Information

The North American Industry Classification System (NAICS) codes and Standard Occupational Classification can provide some insights into the relative size of each industry sector and particular occupations within each sector; ***however the data are often misleading.***

The following chart describes the distribution of jobs by NAICS codes. This is often misleading, as jobs within an industry may be misclassified; however, it does give an indication of the relative size of various industries.

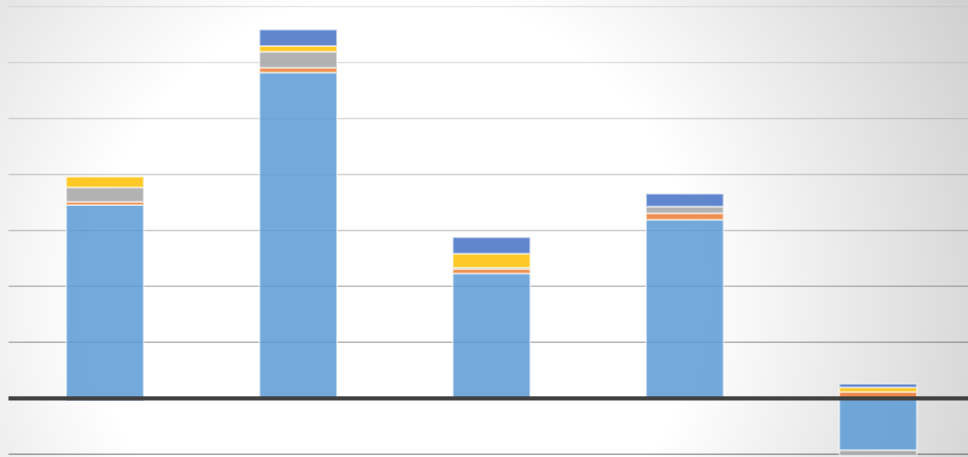


NAICS codes can be misleading for various reasons. On the chart above, the relative size of these industries may be misrepresented for the following reasons:

- Oil and gas only includes extraction jobs. If the Hess Corporation is a good representation of the industry, only four percent of its jobs would fit in this sector, as defined by NAICS codes.
- A large portion of technology jobs are considered “professional, scientific, and technical services” under NAICS codes and may misrepresent the size of the industry. This consists of the following subsectors: legal services; accounting, tax preparation, bookkeeping, and payroll services; architectural, engineering, and related services; specialized design services; computer systems design and related services; management, scientific, and technical consulting services; scientific research and development services; advertising and related services; and other professional, scientific, and technical services.

The following chart describes the net jobs lost or created in each industry sector over time. With the exceptions of information technology in 2011, healthcare in 2014, and manufacturing and “other” in 2015, all industries experienced growth.

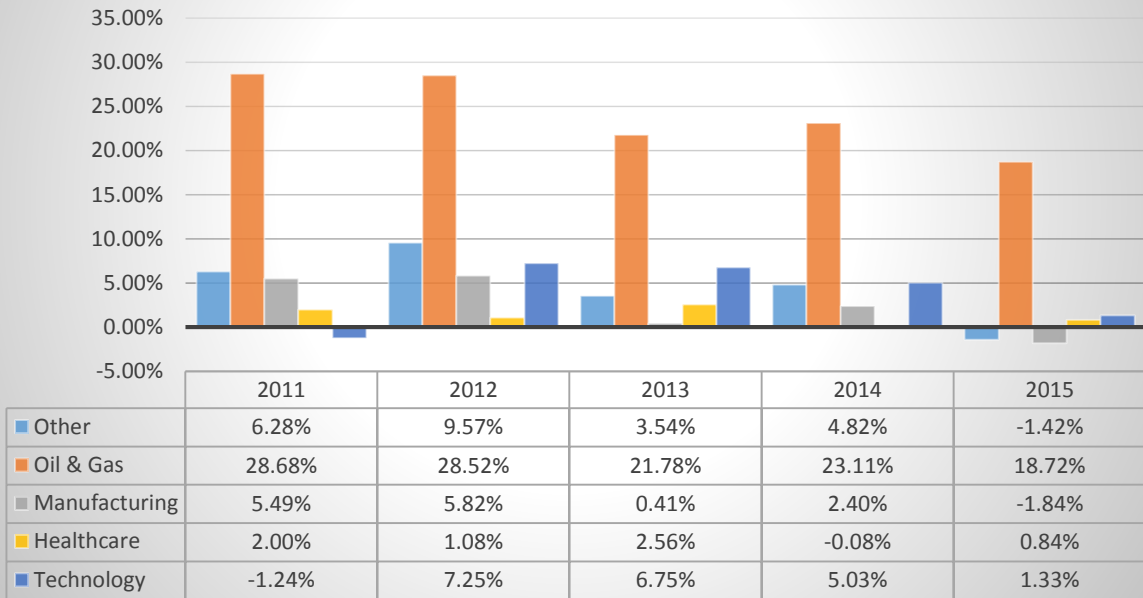
Changes in Number of Jobs by Industry Sector Using NAICS 2010–2015ⁱⁱⁱ



	2011	2012	2013	2014	2015
■ Technology	-231	1460	1458	1143	307
■ Healthcare	955	523	1272	-42	419
■ Manufacturing	1259	1417	101	601	-452
■ Oil & Gas	304	423	413	570	568
■ Other	17270	29118	11153	15957	-4654

The rate of growth has not been consistent across industries. As expected, oil and gas have experienced the greatest rate of growth.

Annual Percentage of Job Growth/Decline by Industry Sector Using NAICS 2011–2015^{iv}



NAICS codes often do not accurately represent the size of industry or growth and changes within occupations. The table below indicates high-growth jobs, defined by Standard Occupational Classification, that are within one or more of the four industries. SOC is often a more accurate depiction of growth and changes in occupations. This table includes related occupations, such as finance, which some informants suggested were hard-to-fill jobs. *Italicized text* indicates the occupation may apply across multiple sectors.

ⁱⁱ U.S. Census Bureau. Longitudinal Employer-Household Dynamics. “North Dakota’s Beginning of Quarter Employment: Counts by NAICS 3-digit Subsectors and Yearly Averages.” Utilized all NAICS 3, then combined per industry. Accessed 28 November 2016. <http://qwiexplorer.ces.census.gov>

ⁱⁱⁱ U.S. Census Bureau. Longitudinal Employer-Household Dynamics. “North Dakota’s Beginning of Quarter Employment: Counts by NAICS 3-digit Subsectors and Yearly Averages.” Utilized all NAICS 3, then combined per industry. Accessed 28 November 2016. <http://qwiexplorer.ces.census.gov>

^{iv} U.S. Census Bureau. Longitudinal Employer-Household Dynamics. “North Dakota’s Beginning of Quarter Employment: Counts by NAICS 3-digit Subsectors and Yearly Averages.” Utilized all NAICS 3, then combined per industry. Accessed 28 November 2016. <http://qwiexplorer.ces.census.gov>

Occupational Projections (Long-Term) for High Demand Occupations in North Dakota in 2014–2024^v

(Note: Includes all occupations in or related to selected industries that anticipate 100+ growth in the next ten years.)

Occupation Code	Occupation	2014 Estimated Employment	2024 Projected Employment	Total 2014–24 Employment Change	Annual Avg. Percent Change	E	HC	IT	M
291141	Registered Nurses	8,392	10,442	2,050	2.20%		X		
311014	Nursing Assistants	7,163	8,647	1,484	1.90%		X		
132011	Accountants and Auditors	4,183	4,830	647	1.40%	X	X	X	X
292061	Licensed Practical and Licensed Vocational Nurses	2,923	3,412	489	1.60%		X		
431011	First-Line Supervisors of Office and Administrative Support Workers	3,662	4,093	431	1.10%	X	X	X	X
151132	Software Developers, Applications	1,273	1,642	369	2.60%	X	X	X	X
311011	Home Health Aides	1,320	1,687	367	2.50%		X		
292041	Emergency Medical Technicians and Paramedics	1,032	1,338	306	2.60%		X		
111021	General and Operations Managers	7,369	7,650	281	0.40%	X	X	X	X
436014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	7,607	7,880	273	0.40%	X		X	X
151151	Computer User Support Specialists	1,396	1,655	259	1.70%	X	X	X	X
131199	Business Operations Specialists, All Other	2,024	2,277	253	1.20%	X	X	X	X
292071	Medical Records and Health Information Technicians	901	1,108	207	2.10%		X		
319097	Phlebotomists	589	775	186	2.80%		X		
119111	Medical and Health Services Managers	843	1,023	180	2.00%		X		
291171	Nurse Practitioners	445	623	178	3.40%		X		

Occupational Projections (Long-Term) for High Demand Occupations in North Dakota in 2014–2024^v

(Note: Includes all occupations in or related to selected industries that anticipate 100+ growth in the next ten years.)

Occupation Code	Occupation	2014 Estimated Employment	2024 Projected Employment	Total 2014–24 Employment Change	Annual Avg. Percent Change	E	HC	IT	M
291123	Physical Therapists	552	725	173	2.80%		X		
292011	Medical and Clinical Laboratory Technologists	655	821	166	2.30%		X		
319092	Medical Assistants	668	831	163	2.20%		X		
499081	Wind Turbine Service Technicians	158	311	153	7.00%	X			
113031	<i>Financial Managers</i>	973	1,115	142	1.40%	X	X	X	X
151121	<i>Computer Systems Analysts</i>	537	673	136	2.30%	X	X	X	X
151199	<i>Computer Occupations, All Other</i>	740	875	135	1.70%	X	X	X	X
131111	<i>Management Analysts</i>	660	791	131	1.80%	X	X	X	X
291127	Speech-Language Pathologists	580	710	130	2.00%		X		
319091	Dental Assistants	674	803	129	1.80%		X		
436013	Medical Secretaries	535	663	128	2.20%		X		
113021	<i>Computer and Information Systems Managers</i>	519	645	126	2.20%	X	X	X	X
291122	Occupational Therapists	410	531	121	2.60%		X		
292021	Dental Hygienists	624	744	120	1.80%		X		
131041	<i>Compliance Officers</i>	1,161	1,262	101	0.80%	X	X	X	X

^v Labor Market Information Center. Job Service North Dakota, Projections Unit. “Occupational Projections (Long-term) for Multiple Occupations in North Dakota in 2014-24.” Accessed 30 November 2016. <https://www.ndworkforceintelligence.com>

General Recommendations

FHI 360 gathered information from a number of sources. Based on this information, feedback, and personal experiences, members of WEAC, other members of industry, and other North Dakota leaders developed overall recommendations. Industry-specific recommendations are provided in later sections. The following section describes findings and recommendations that may apply to two or more industries to inform education and workforce strategies.

Observation: Currently, industries and departments are often segmented creating a siloed system that currently does not consistently meet workforce needs.

Recommendation 1: Establish a statewide workforce vision for K–16 education addressing the needs of industries that drive North Dakota’s economy. Guided by the Governor, Chancellor, State Superintendent, and other stakeholders, the vision should consist of measurable goals and a marketing strategy. This WEAC report can provide baseline information, with a focus on student, employer, and business outcomes rather than funding streams for departments. The vision may also build on existing strategies such as the [“Find the Good Life”](#) campaign.

To develop this vision, the group may need to:

- a) Identify industry needs;
- b) Address the needs of both sector and skills;
- c) Map the existing education and workforce system;
- d) Strengthen education workforce alignment, and
- e) Measure results.

WEAC and other stakeholders have made the following recommendations (2-6) for each of these elements.

Observation: Identifying needs across industries in a consistent way will help compare needs and identify priorities. There is no standard tool to gain feedback from business and industry on the knowledge, skills, and competencies of recent graduates or the workforce in general. Individual trade associations survey members to identify workforce needs, leading to data that cannot easily be compared and making it difficult to identify cross-industry needs.

Recommendation 2: Continue to identify industry needs through:

- Development of a workforce needs survey that could be administered across industries, with additional industry-specific questions added if necessary.
- Creation of industry sector-specific or cross-cutting assessments of workforce needs, administered at regular intervals on an ongoing basis, like the [“Biennial Report on Health Issues for the State of North Dakota”](#) prepared by the University of North Dakota School of Medicine and Health Sciences (SMHS) Advisory Council.

Observation: Across numerous efforts, North Dakota has taken an industry sector-based strategy to addressing workforce needs with a particular focus on energy, healthcare, information technology/technology, and manufacturing. While this helps growing industries and aligns with federal

policy, it creates siloes that often overlook occupations and skills that cut across sectors and make the workforce less flexible during rapid changes in the State economy.

Recommendation 3: Consider new and different approaches to gathering and identifying industry needs:

- When identifying education and workforce needs, organize research, working groups, and impact measures for both sector *and* skills (e.g., industry and occupation).
- The use of career lattices can help identify the occupations with cross-cutting skills, including STEM skills, that can be applied across industries. Consider identifying the most common occupations needed across industries, develop career lattices, and complete appropriate marketing to individuals in those occupations or in related occupations. For example, due to increases in automation, there appears to be increased demand for instrumentation and electrical technicians (I&E technicians) in both the energy and manufacturing sectors. These jobs require expertise in both electrical trades and computer networking. Educating individuals in those discrete occupations, as well as existing I&E technicians, about the transferability of skills across industries could make workers in both industries more responsive during economic changes. Other occupations with cross-cutting skills may include maintenance mechanics; health, safety, and regulatory officers; sales and customer service; financial managers/analysts; project managers; and department managers.

Observation: TrainND appears to be highly responsive to local and regional workforce needs; however, two- and four-year programs do not necessarily build off these programs or offer credit-bearing courses building off TrainND courses. A stronger understanding of how TrainND responds to industry needs through specific certifications and credentials may help the university system be more responsive, while also establishing programs to respond to longer term needs of industry.

Recommendation 4: Map the existing system to create efficiencies.

Map TrainND certifications against workforce needs and cross-walk industry-based certificates to university-recognized programs. Pay particular attention to the location of delivery, the particular workforce needs in that region, and how the university system builds on TrainND programs.

Observation: While there are numerous dual credit courses in North Dakota, secondary-post-secondary alignment is still limited; the college dropout rate is particularly high for numerous reasons, including students being unaware of career opportunities and the educational requirements needed for those careers, the lack of alignment between high school and college coursework, and the difficulty of transition.

Recommendation 5: Strengthen education-workforce alignment through:

- Strengthen career planning and career exploration activities at the K–16 level, with a particular focus on lower grades.
- Map career clusters to industries and occupations. This will help secondary students, counselors, and other educators align coursework with careers. Simply mapping career clusters to industries and occupations will not be enough—intensive marketing to schools, students, and families will also be necessary.

- Strengthen the alignment between secondary (high school), community college (two-year/associate degree), and university (four-year degree) plus continuing education in the state. To our knowledge, there are limited opportunities for high school students to begin a course of study that earns credits toward a technical associate degree.^{vi} The connection of a technical associate degree to a four-year degree, then ongoing education and training is further weakened. The role of secondary education (both Department of Public Instruction and Department of Career and Technical Education) to align coursework and educational standards with the rigors of the university system are essential.
- Strengthen lifelong learning by enabling incumbent workers to upgrade skills through stackable credentials, certifications, and associate programs.

Observation: You can't manage what you don't measure. As industries and the economy change, the measures may evolve.

Recommendation 6: Measure results of vision. Use the industry survey and industry reports, as well as other pre-determined data points, and measure progress of the vision over time.

Observation: New entrants to jobs, incumbent workers, and transitioning (disengaged) workers lack knowledge of specific jobs and career pathways and ongoing education and training required to maintain excellence within those jobs.

Recommendation 7: Consider **utilizing alumni networks** to strengthen continuing education of graduates. Both the university system and TrainND provide opportunities to upskill professionals in high demand occupations.

Observation: Across all sectors, employees lacked technology skills, including a lack of understanding of basic desktop computer applications such as Microsoft Office and mobile applications specific to the industry. Nearly all industries suggested new and existing employees lacked technical skills for basic software packages such as Microsoft Office, as well as more advanced or industry-specific software and technologies such as databases, mobile applications, and project management tools.

Recommendation 8: Identify the standard industry tools (e.g., computer software and mobile applications) **and technology skills needed** to be successful and integrate training on them into existing curriculum. Elements of this may include:

- Mapping where technology education is currently being taught. (K–12? Higher education?)
- As English and Math state standards are currently being re-written, consider adding technology competencies. Integrating basic technology into existing coursework will help students and new and existing employees understand and utilize technology within their work.
- Align technology education with industry-appropriate standards on current IT technologies (e.g., Microsoft Office 365), but respond to changing industry needs.

Observation: Across all industries, businesses noted the particular foundational skills needed for new and incumbent workers. Communication skills, both verbal (listening, presentation, and conversational to different stakeholders) and written (formal, informal, and work specific such as email

communications and industry-specific writing such as work orders, project plans), as well as time management/ability to prioritize tasks, and problem-solving/troubleshooting were named repeatedly as skills workers were lacking.

Some industry leaders suggested they have difficulty hiring high level executives. The ability of staff to take on leadership and supervisory positions varies by industry; however, every industry noted some area for improvement.

Recommendation 9: Strengthen foundational skills development at the K–16 levels through several strategies including:

- Integrate foundational skills development into all courses and all programs. The Department of Career and Technical education has developed “Career Ready Practices” and a rubric to measure specific soft skills that helps educators grade/score students on specific soft skills. Tools like this can help educators measure soft skills attainment.
- The State may also consider applying a standards-based approach to soft skills valued by industry and benchmarked against other states.
- Integrate written assignments and presentations into appropriate technical coursework. Longer project-based learning can also reinforce problem-solving practices and can require written and verbal elements.^{vii}

Observation: If recommendations 2 and 3 are implemented (ongoing feedback from industry through surveys and biennial reports) and the vision is established, then systems will be created to engage industry.

Recommendation 10: At the completion of final research, **disband WEAC and transfer responsibilities** to the Workforce Development Council.

^{vi} One notable exception is the Instrumentation & Control Technology program at Bismarck Public High School and Bismarck State College.

^{vii} A strong example of a technical program requiring these elements is the Petroleum Production Technology program at Williston State College, which requires students to complete semester projects and give presentations.

Industry Reports

Energy

Energy was the first sector report completed. It began with existing information gathered for the Hess Corporation. Due to limitations in publicly available data related to the oil and gas industry, the categorization of the data, and the ability and interest of the Hess Corporation to provide internal data, as well as FHI 360 staff expertise, this sector report consists of slightly different data-gathering methods and more in-depth findings and recommendations.

Information Gathering Methods

FHI 360 used the Hess Corporation as a representative of the oil and gas industry since NAICS codes only define the industry as oil and gas extraction. Interviews with other oil and gas professionals were completed to determine if the findings were consistent across the industry. Other publicly available data informed other energy-sector jobs. A review of standard occupational codes also guided identification of growth occupations within the sector.

A brief description of the information gathering process and its limitations are as follows:

- **Organization of job categories:** In collaboration with Hess' human resources and training departments, FHI 360 divided Hess' North Dakota workforce into seven job categories, primarily based on skills. Hess then aligned specific job titles with each of the job categories.
- **CAREER MANAGER data analysis:** FHI 360 analyzed data regarding Hess' current workforce and, if available, workforce over the past five years, using basic employment data from CAREER MANAGER (e.g., demographic data—age, education, etc.—of staff by identified job categories). For the purposes of this research, the data only included Hess staff based in North Dakota. These data did not include Hess staff in-state for a task, on two-year rotations, or head count contractors. FHI 360 attempted to identify potential workforce shortages among groups not included in these data through interviews and other data collection efforts.
- **Informant interviews:** FHI 360 conducted informational gathering interviews with staff from human resources, training, senior management, and a senior advisor to inform interview questions and the overall information gathering design process.
- **Manager interviews:** FHI 360 interviewed select staff from senior management, human resources, the training department, and directors/leads of departments from different job categories to identify staffing trends. For all job categories, about 10 percent of staff were interviewed, with the exception of support services. Due to the wide range of job titles in support services, an over-sampling of interviews was completed to attempt to address the specific job areas. FHI 360 conducted interviews over a three-week period in July 2016. Due to summer vacations and rotations, some targeted interviewees were not reached.
- **Comparisons to other research:** North Dakota has made significant investments to understand the oil and gas labor market. Previous research, including that completed by NDSU Extension Service, has relied on NAICS codes to classify growth aligned with standard employment projections. While this is useful for statewide projections, we elected to use a different, more specific breakdown to help understand the specific knowledge, skills, and abilities required for types of positions. This will provide more specific information to the university system on workforce needs, but may make it difficult to align this report with other, more standard, workforce research.

Limitations and Caveats of the Findings

There are several limitations in the findings of the report. These include, but are not limited to:

- Changes in technology are difficult to predict. FHI 360 asked managers about technological changes and how these may impact the workforce; however, some technology may be unforeseen at this time.
- Given dramatic changes in oil prices, it is difficult to project prices in five years. FHI 360 applied a very conservative price (estimated at \$60/barrel) in 2021 when asking managers to predict their future workforce needs
- The CAREER MANAGER data set did not include data for contractors, staff on assignment, and head count contractors that will need to be replaced. FHI 360 attempted to address these subgroups in interviews.
- Some job categories have a very small number of staff. In an effort to clearly communicate results, FHI 360 elected to use whole numbers instead of percentages.

Comparison of Oil and Gas Companies in North Dakota

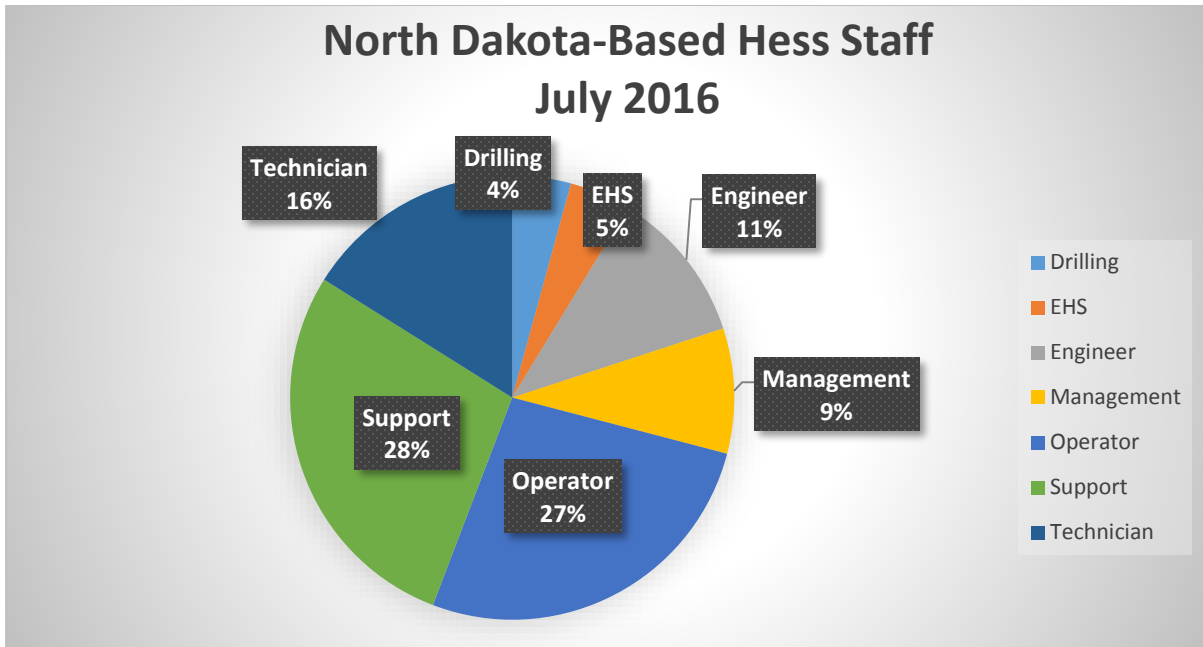
While Hess served as a proxy for the oil and gas industry, there are some notable differences. Compared to other oil and gas companies with operations in North Dakota, a larger portion of Hess' workforce consists of direct Hess employees. The following describes how Hess can serve as a proxy for the industry:

- Hess has a higher proportion of managers and support services in North Dakota than other energy companies, which often have headquarters in Houston or Denver.
- Hess may have a larger footprint of Environment, Health, and Safety staff in North Dakota than other companies. Other companies often base a portion of these staff members in headquarters like Denver or Houston.

Energy Workforce Composition – 2016

FHI 360 completed a detailed analysis of Hess' workforce by job categories determined by job titles. A separate and private report details the age, education, and years at company, as well as an analysis of knowledge, skills, and abilities and gaps within each of those areas. The high-level findings of this research are included in this report.

- Just over one in four of Hess personnel are operators, positions which require a high school diploma as well as technical and mechanical skills. Another 16 percent of the staff are technicians, including mechanics, whose desired education level is a two-year technical degree.



Using Standard Occupational Classifications, several occupations within energy were identified to have the highest rates of growth in North Dakota as follows.

Occupational Projections (Long-Term) for High Demand Energy Occupations in North Dakota in 2014–2024^{viii}

Occupation Code	Occupation	2014 Estimated Employment	2024 Projected Employment	Total 2014–2024 Employment Change	Annual Avg. Percent Change
499081	Wind Turbine Service Technicians	158	311	153	7.00%
514041	Machinists	726	825	99	1.30%
499044	Millwrights	247	286	39	1.50%
192041	Environmental Scientists and Specialists, Including Health	307	324	17	0.50%

Energy Findings and Recommendations

Findings

The following section provides findings both across job categories and substantial findings within job categories.^{ix}

- **Finding: Demand for secondary vs. post-secondary education:** Generally, most staff have the minimum education required for their jobs; however, some positions (e.g., technicians) will need more formal education (two-year technical degrees) in the next five years. While a high school education may be sufficient for some positions in the drilling and operator job categories, advanced science and math coursework (geology, algebra, chemistry, and physics) is needed, as well as strong soft skills, including written and verbal communication, time management, the ability to prioritize tasks, and problem-solving. Additionally, there may not be existing relationships and pathways between secondary and post-secondary coursework for some of these job categories.^x
- **Finding: Growth of environment, health, and safety (EHS) positions:** EHS will become increasingly important with increasing specialization. Individuals with specific professional credentials will be highly sought after.
- **Finding: Increased need for knowledge of the regulatory environment:** All staff working in the field will need a basic understanding of the regulatory environment, including the regulatory agencies and their purposes, how regulations might impact how work is completed and managed, and an understanding of when and how to elevate potential regulatory issues.
- **Finding: Growth in technician positions:** The technician job category^{xi} is expected to grow at a rate greater than other job segments at Hess. Based on the current number of technician graduates in North Dakota, if Hess is indicative of the industry, there may be a shortage of technicians by 2021.^{xii}
- **Finding: Increased reliance on system automation and exception-based surveillance:** Automation of systems and increased reliance on exception-based surveillance will require staff in several job categories to have increased knowledge and skills in these areas.
- **Finding: Increased reliance on advanced software packages:** Some staff struggle with computer programs and mobile technology. As Hess becomes increasingly reliant on databases, Microsoft Office, computer-based maintenance management systems, and project management systems, new hires will need computer literacy and the ability to quickly learn new programs and applications.
- **Finding: Knowledge of strong business practices:** Across multiple roles, Hess staff need experience with project management and LEAN principles applying safety, quality, cost, and delivery. Understanding the basic principles and theories of these are beneficial to new hires. Some staff roles, both in project planning and management, require advanced project management skills that some staff lack. Further, Hess has fully adopted the philosophy of LEAN principles, but must continuously develop staff knowledge and understanding of the principles. Industry interviews suggest that Hess may take LEAN principles more seriously than others in the industry, but cost-saving efforts were particularly important.

- **Finding: Need for improved communication skills:** Managers described the increased importance of strong communications skills, both written and verbal; the ability to communicate across functions and audiences in the company; and the ability to have “courageous” or difficult conversations.
- **Finding: Ongoing need for strong soft skills:** Managers also described staff as needing to develop strong soft skills to prioritize work, solve problems, and troubleshoot.

Recommendations

- **Recommendation for new entrants:** Encourage the development of a stronger link between high schools and post-secondary institutions, such as Career and Technical Education programs of study, with a particular focus on technician positions. The development of programs of study, or programs where students earn specific credits during high school that transition to college-level course work, would be desirable.
- **Recommendation for new entrants and incumbents:** Post-secondary institutions preparing individuals for jobs in the oil and gas industry may consider adding a specific course related to the regulatory environment or adding regulatory topics to existing courses. A particular focus on monitoring processes would be beneficial.
- **Recommendation:** Integrate written assignments and presentations into appropriate technical coursework. More extensive project-based learning programs can also reinforce problem-solving practices and can require written and verbal elements.
- **Recommendation:** Cross-curricular training and project-based learning are two strategies to strengthen problem-solving and troubleshooting skills.
- **Recommendation:** According to informants, there are no post-secondary EHS programs (certificate or bachelor) in North Dakota. The state may benefit from learning about the demand for these types of programs from other oil and gas companies and determine if there is a need to develop them.

^{viii} Labor Market Information Center. Job Service North Dakota, Projections Unit. “Occupational Projections (Long-term) for Multiple Occupations in North Dakota in 2014–2024.” Accessed 30 November 2016.

<https://www.ndworkforceintelligence.com>

^{ix} Job categories were established to group like job titles or occupations that may be similar knowledge, skills, and abilities required.

^x Based on other FHI 360 research conducted privately for Hess, we believe there are limited opportunities for high school students to begin a program of study in high school with coursework that serves as the formal foundation for college-level work and expedites years of education required to earn an associate or bachelor degree.

^{xi} Engineering, field, lab, and surface land technicians and specialist positions, as well as maintenance mechanics are included in this job category.

^{xii} Note: This finding is partially based on other research FHI 360 has completed for Hess.

Information Technology

The following section was developed using existing information and data from public sources, through a survey of individuals working in North Dakota information technology, and through limited interviews. Please review the Information Gathering Methods and Limitations and Caveats of the Findings sections of this report for more information.

Information Gathering Methods

- FHI 360 conducted informational interviews with one information technology professional and one trade association representative to help shape the survey and identify secondary sources of data.
- FHI 360 conducted secondary data research, relying heavily on U.S. Census Bureau, Job Service North Dakota, and State Information Technology Department to understand education and years of experience data. This may or may not be a good representative of statewide industry needs.
- FHI 360 sent the survey to 66 contacts from 63 organizations. Twenty-five people responded to the survey; however, only 11 people answered all open-ended questions. The contact list consisted of human resources professionals in information technology, as well as board and legislative committee members from the Information Technology Council of North Dakota.

Limitations and Caveats of the Findings

Data are limited by the publicly available data and the small number of responses to the survey. A past survey of the North Dakota Information Technology Department staff was used to determine the age and education of employees, while publicly available data helped determine the size of the industry.

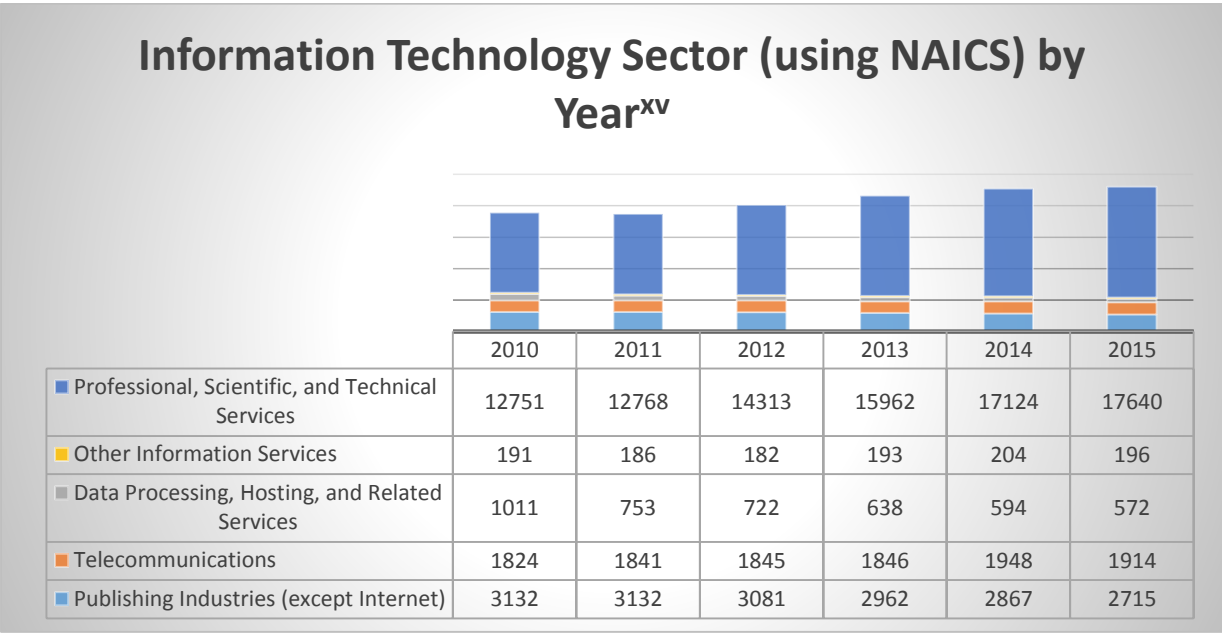
FHI 360 also conducted a survey to determine changes in education and knowledge, skills, and abilities required as well as external factors impacting the workforce. The survey results should be considered anecdotal in nature due to the limited response rates.

Snapshot of Information Technology in North Dakota

Publicly available data on information technology is difficult to discern as NAICS codes categorize some technology jobs and jobs requiring technical skills in other categories. For the purposes of this snapshot, the following NAICS codes were used: 51511 (publishing industries, except internet), 51517 (telecommunications), 51518 (data processing, hosting, and related services), 51519 (other information services), and 51541 (professional, scientific, and technical services). Since this does not capture the entire industry, we have also used the North Dakota Information Technology Department as a proxy for other elements of the industry, as well as data from the Information Technology Council of North Dakota.

Overall, information technology, as categorized by these NAICS codes, has grown steadily for the past six years. Professional, scientific, and technical services^{xiii} have grown year over year, while other information services and publishing industries (except internet) have declined year by year. Further, NAICS codes may not be a good representation of the information technology sector, as the subsector

“professional, scientific, and technical services” applies across multiple industries.



Current Demographics

The following section describes current demographics of individuals working in information technology in North Dakota, as well as education expectations based on surveys, to provide introductory information about the current workforce. Supplemental data from the North Dakota Information Technology Department accompanies the publicly available data, as age and education information is not available in the aforementioned NAICS codes.

- Age and education level could not be determined using NAICS data, as the information is not available. As a result, a survey of the North Dakota Information Technology Department staff provided a proxy for age, through questions about years of experience and eligibility for retirement, and for education levels of information technology workers.
- According to a survey of North Dakota Information Technology Department staff, employees have a range of years at their current employer, with just under one quarter (22 percent) of employees with the organization for six to 10 years and nearly one third (31 percent) with the organization for 16 years or more.^{xv}

Years of Experience With Current Employer (ITD)^{xvi}



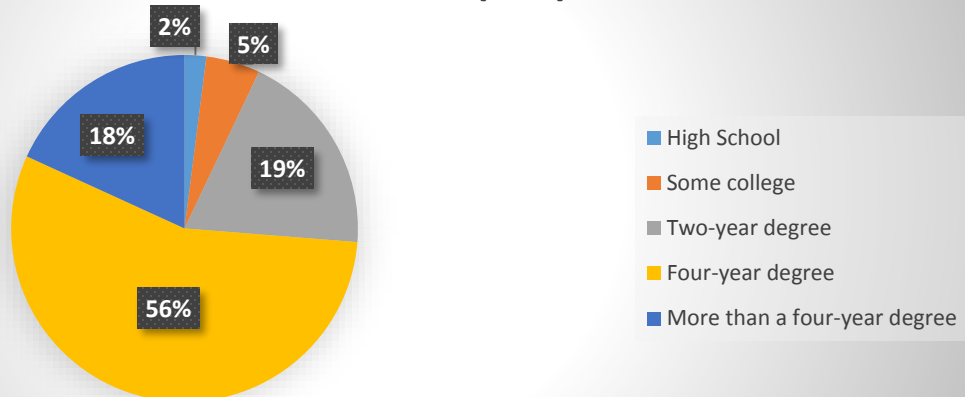
At present, 12 percent of staff are eligible to retire; however, by 2021, another 12 percent will be eligible to retire, meaning nearly one in four staff will be eligible to retire by 2021.^{xvi}

Retirement Eligibility (ITD)^{xvi}



Nearly three-quarters of employees (74 percent) have a four-year degree or more.

Education Level (ITD)^{xvi}



FHI 360's survey of IT workforce professionals suggests current education expectations within information technology vary by job category; however, all job categories desire at least an associate degree. The type of degree or subject area was not described in the survey. Survey respondents felt the desired education by job category is as follows:

Job Category	Most Commonly Desired Education Level
Security and disaster recovery	Bachelor degree (7)
Quality assurance	Associate degree (4), Bachelor degree (3), Don't know (3)
Software development	Bachelor degree (7), Associate degree (3)
Architecture	Bachelor degree (7), Don't know (3)
Network services	Bachelor degree (6)
Computer systems (operators, desktop support, databases, system administration)	Associate degree (5), Bachelor degree (4)
Enterprise services/service desk	Associate degree (6), Bachelor degree (4)
Program managers, project managers	Bachelor degree (10)

A limited number of survey respondents identified certifications related to project management and business analysis as important to some positions. Other certifications may be important to some technical positions; however, according to informants, this may be determined by the specific business.

Anticipated Changes in Demand and Implications for Education/Competencies by 2021

The following section describes the education levels and technical and soft skills that survey respondents hoped employees would have by 2021, as well as other information from secondary sources.

- In 2014, “Nearly 60 percent of respondents indicated workforce needs are not being met. The primary causes indicated are shortage of available general workforce and lack of skills in available workforce,” according to the North Dakota Information Technology Council.^{xvii}
- The majority of FHI 360 survey respondents (11/15) suggested the number of employees needed will increase in the next five years, across nearly all job categories.
- Using the Standard Occupational Classifications, Job Service North Dakota also predicts growth across many occupations per the table below.

Occupational Projections for Select IT Occupations in North Dakota in 2014–2024^{xviii}					
Occupation Code	Occupation	2014 Estimated Employment	2024 Projected Employment	Total 2014–24 Employment Change	Annual Avg. Percent Change
113021	Computer and Information Systems Managers	519	645	126	2.20%
151121	Computer Systems Analysts	537	673	136	2.30%
151122	Information Security Analysts	127	161	34	2.40%

Occupational Projections for Select IT Occupations in North Dakota in 2014– 2024^{xviii}

Occupation Code	Occupation	2014 Estimated Employment	2024 Projected Employment	Total 2014–24 Employment Change	Annual Avg. Percent Change
151131	Computer Programmers	493	483	-10	-0.20%
151132	Software Developers, Applications	1,273	1,642	369	2.60%
151133	Software Developers, Systems Software	381	475	94	2.20%
151134	Web Developers	273	370	97	3.10%
151141	Database Administrators	158	188	30	1.80%
151142	Network and Computer Systems Administrators	523	585	62	1.10%
151143	Computer Network Architects	153	189	36	2.10%
151199	Computer Occupations, All Other	740	875	135	1.70%
251021	Computer Science Teachers, Post-secondary	73	79	6	0.80%

Projected education expectations within information technology vary by job category. Survey respondents felt the desired education by job category is as follows. **Bolded text** indicates increases in the desired education level by a greater number of survey respondents.

Job Category	Most Commonly Desired Education Level
Security and disaster recovery	Bachelor degree (7)
Quality assurance	Bachelor degree (8)
Software development	Bachelor degree (7), Associate degree (2), Graduate degree or more (2)
Architecture	Bachelor degree (7), Graduate degree or more (4)
Network services	Bachelor degree (9)
Computer systems (operators, desktop support, databases, system administration)	Bachelor degree (6) , Associate degree (4)
Enterprise services/service desk	Bachelor degree (9)
Program managers, project managers	Bachelor degree (6), Graduate degree or more (5)

Changes in Knowledge, Skills, and Abilities (KSA)/Competencies

While the FHI 360 survey had a limited number of respondents, responses to open-ended questions regarding knowledge, skills, and abilities were consistent with state data from information technology and workforce professionals.

- Survey respondents stated that verbal and written communication skills were of the utmost importance. Some highlighted the importance of communicating well with all levels of employees, providing customer service (through listening), and having good presentation skills. Other important soft skills include the ability to work in teams and problem solve. Informant interviews reinforced the need for strong problem-solving skills.
- The majority of survey respondents (12/16) felt employees are prepared to take on supervisory and leadership positions, with one informant suggesting high level positions are still difficult to fill.
- Survey respondents did not perceive that there would be an overriding change in the field impacting workforce; however, increases in automation, security threats, and an increased reliance on the cloud appear to be some trends. A survey by the North Dakota Information Technology Council in 2016 found that “nearly 90 percent of respondents indicated security is currently their biggest challenge,” with IT demand and limited workforce as the second greatest concern.^{xix}
- Some respondents suggested the ability to recruit and utilize remote workers may impact the workforce since it is difficult to find local talent. An informant suggested businesses would prefer to hire locally, but there may be a lack of local talent, forcing the use of remote workers.

Information Technology Findings and Recommendations

Findings

- **Finding:** While a majority of IT staff (possibly three in four) have a bachelor degree or more, there appears to be a shortage of IT professionals and lack of skills in available workforce. This suggests some recent graduates do not have the necessary technical expertise and incumbent workers lack required expertise.
- **Finding:** While many recent hires lack required expertise, informants and survey responses suggest soft skills, especially written and verbal communications, team work, and problem-solving, were as important to employability. Businesses may train to particular standards and technical areas, but individuals must be competent in these areas.

Recommendations

- **Recommendation:** Technology should be integrated into curriculum and learning objectives at the secondary and post-secondary level.
- **Recommendation:** At the post-secondary level, consider integrating technical coursework into liberal arts education.
- **Recommendation:** Establish career exploration and planning at a younger age. Programs such as the IT career expo in Fargo serve as one platform. Job shadows, classroom presentations, and other work-based learning activities can also help students learn about information technology careers.
- **Recommendation:** Conduct a study to determine where employees get their degrees, and in what content areas, and map degree programs to industry standards. If appropriate, develop certification programs and associate degree programs to address need. As possible, integrate video classroom delivery.
- **Recommendation:** Consider establishing internship requirements for particular post-secondary degree programs to ensure students have a clear understanding of expectations. Recent use of Operation Intern has been beneficial, but hasn't necessarily met demand.
- **Recommendation:** Consider integrating writing and presenting in technical courses. Cross-curricular exercises are particularly beneficial.

^{xiii} The professional, scientific, and technical services sector consists of the following subsectors: legal services; accounting, tax preparation, bookkeeping, and payroll services; architectural, engineering, and related services; specialized design services; computer systems design and related services; management, scientific, and technical consulting services; scientific research and development services; advertising and related services; and other professional, scientific, and technical services.

^{xiv} U.S. Census Bureau. Longitudinal Employer-Household Dynamics. "North Dakota's Beginning of Quarter Employment: Counts by NAICS 3-digit Subsectors and Yearly Averages." NAICS Sectors: 51511 (publishing industries, except internet), 51517 (telecommunications), 51518 (data processing, hosting, and related services), 51519 (other information services), and 51541 (professional, scientific, and technical services). Accessed 30 November 2016. <http://qwiexplorer.ces.census.gov>

^{xv} ND Information Technology Department. Survey of Employees. 2016

^{xvi} Note: Eligibility for retirement within ITD is based on 1) age, 2) years at ITD, and 3) start date at ITD. Retirement assumptions at other technology entities may be different.

^{xvii} Information Technology Council of North Dakota. “State of the IT Industry 2015 Guide.” Accessed 30 November 2016. <http://cl-itcnd-website-test.sycorr.net/wp-content/uploads/2016/02/ITCND-Guide-2015-Final.pdf> Pg. 21

^{xviii} Labor Market Information Center, Job Service North Dakota, Projections Unit. “Occupational Projections (Long-term) for Multiple Occupations in North Dakota in 2014–2024.” Accessed 2 December 2016. <https://www.ndworkforceintelligence.com>

^{xix} Information Technology Council of North Dakota. “State of the IT Industry Guide 2017.” Pg. 21

Manufacturing

The following section was developed using existing information and data from public sources, a survey of individuals working in North Dakota manufacturing, and limited interviews. Please review the Information Gathering Methods and Limitations and Caveats of the Findings sections of this report for more information.

Information Gathering Methods

- FHI 360 conducted an informational interview with one manufacturing professional and one trade association representative to help shape the survey and identify secondary sources of data. The manufacturing professional also tested the survey.
- FHI 360 conducted secondary data research, relying heavily on U.S. Census Bureau data for age and education information.
- FHI 360 sent the survey to 38 contacts from 23 organizations. Sixteen people responded to the survey, but only five people answered all open-ended questions.

Limitations and Caveats of the Findings

Data are limited by the publicly available data and the small number of responses to the survey. NAICS codes were used to determine the size of the industry and age and education of employees. Standard Occupational Codes cannot as easily be applied to manufacturing.

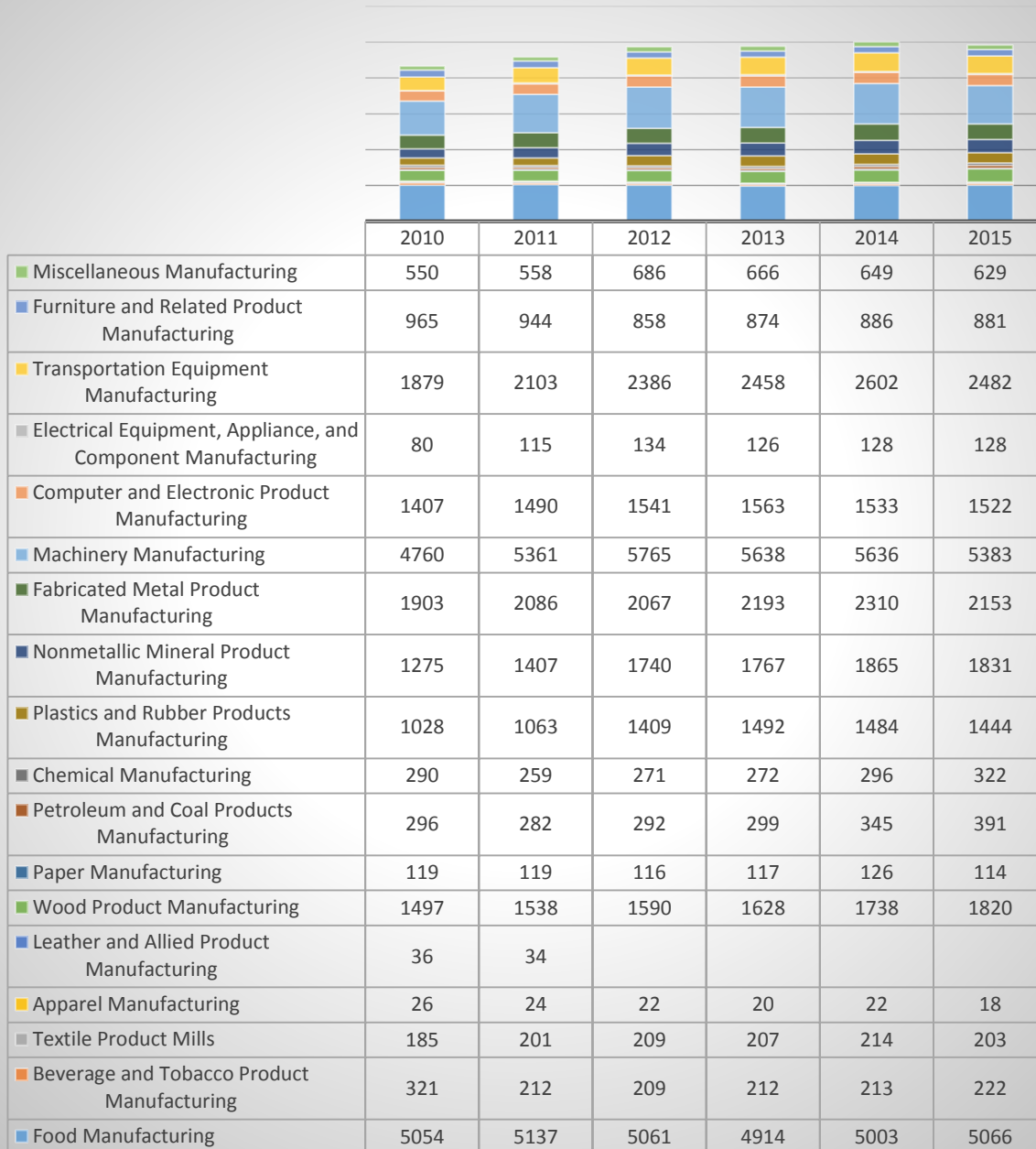
The survey results should be considered anecdotal in nature due to the limited response rates; however, the findings are consistent with other workforce research on manufacturing nationally.

Snapshot of Manufacturing in North Dakota

NAICS codes were used to determine the size of the sector.

Overall, manufacturing, as categorized by these NAICS codes (31–33), has grown steadily for the past six years. However, four subsectors (food, fabricated metal product, machinery, and transportation equipment) make up 61 percent of these jobs. Fabricated metal product, machinery, and transportation equipment saw steady growth over the past six years, while food manufacturing had little net growth over six years (12 additional positions). Beverage and tobacco product and furniture and related product manufacturing saw the greatest reduction in positions.

Manufacturing Sector (using NAICS) by Year^{xxi}

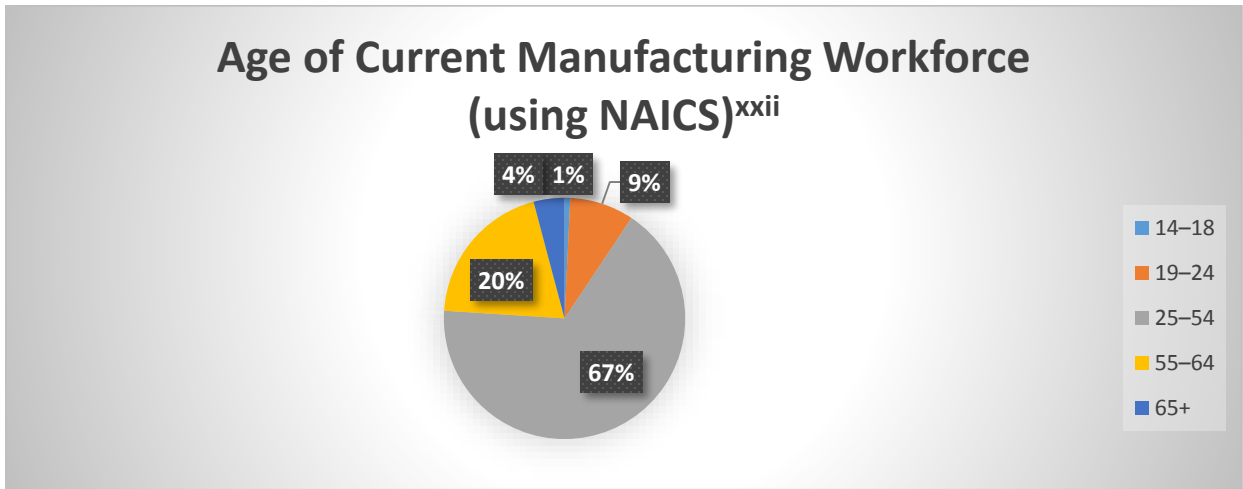


Current Demographics

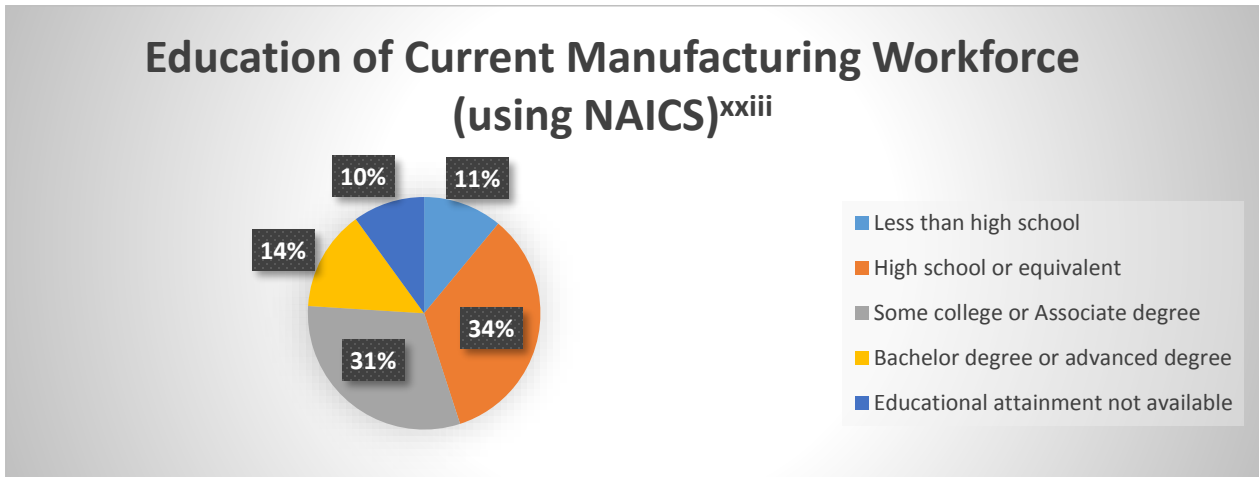
The following section describes the demographics of individuals currently working in manufacturing in North Dakota, as well as education expectations based on surveys, to provide introductory information about the current workforce.

- As of 2015, the majority of manufacturing employees (67 percent) were between the ages of 25 and 54. Twenty percent were aged 55 to 64.^{xxi} Only four percent of manufacturing employees

were 65 or older.



One out of every three manufacturing employees has a high school degree or equivalent (34 percent) or some college or associate degree (31 percent). Nearly 15 percent have a bachelor degree or advanced degree (14 percent) and 11 percent have less than a high school degree. Data are not available for 10 percent of manufacturing employees.^{xxii}



Current education expectations for employees within manufacturing vary by job category. Survey respondents reported the desired education by job category as follows:

Job Category	Most Commonly Desired Education Level (Number of Respondents in Parentheses)
Sales	High school (3), Associate degree (2), and Bachelor degree (2)
Safety and quality	Technical certificate (5), Associate degree (3)
Maintenance	Technical certificate (5), Associate degree (2)
Management	Bachelor degree (4), Associate degree (3)

Operators/Manufacturing	High school (5), Technical certificate (3)
Logistics	High school (4), Associate degree (3)

Anticipated Changes in Demand and Implications for Education/Competencies by 2021

The following section describes the education levels and technical and soft skills that survey respondents hoped employees would have by 2021.

Survey respondents suggested increased education would be desired across five of the six job categories. **Bolded text** indicates increases in the desired education level by a greater number of survey respondents.

Job Category	Most Commonly Desired Education Level
Sales	Associate degree (3), High school (2), and Bachelor degree (1)
Safety and quality	Associate degree (4), Technical certificate (2), Bachelor degree (2)
Maintenance	Technical certificate (5), Associate degree (2)
Management	Bachelor degree (6)
Operators/Manufacturing	Technical certificate (4), High school (3)
Logistics	Associate degree (3), High school (2), Technical certificate (2)

Changes in Knowledge, Skills, and Abilities (KSA)/Competencies

While the survey had a limited number of respondents, responses to open-ended questions regarding knowledge, skills, and abilities were consistent with national data from manufacturers and workforce professionals.

- Communication, teamwork, and problem-solving were the three most important soft skills highlighted by survey respondents.
- Survey respondents were divided on whether employees were prepared to take on supervisory and leadership positions. (four=yes, four=unsure, one=no).
- External factors impacting manufacturing include Occupational Safety and Health Administration (OSHA) regulations, economic conditions, and the oil and gas industry, according to some survey respondents. (Note: These are **perceived** factors impacting the industry).

Manufacturing Findings and Recommendations

Findings

- **Finding:** According to North Dakota, survey respondents and other national data, jobs in sales, safety and quality, maintenance, management, operators/manufacturing, and logistics will require higher levels of education in the future. The number of individuals with appropriate technical certificates or degrees may not meet industry needs in the future.
- **Finding:** Survey respondents perceive the impact of the oil and gas industry on hiring in the manufacturing industry to be substantial, driving a need for higher salaries and limiting growth. However, based on employment numbers from the U.S. Census Bureau, we could not confirm a negative impact of the oil and gas industry on hiring in manufacturing.
- **Finding:** Several of the job categories (sales, safety and quality, maintenance, management, and logistics) require skills that are transferrable to other industries.

Recommendations

- **Recommendation:** Secondary and post-secondary students need more exposure to manufacturing jobs through internships, workplace tours, and other work-based learning. Integrate information about transferable skills into high school career planning and post-secondary academic advising.
- **Recommendation:** Consider developing programs or programs of study, in which students begin to earn relevant credits in high school, then transition to post-secondary programs. Where appropriate, explore certificate programs. This may require industry donation of goods and advising of program development.
- **Recommendation:** Manufacturing jobs, especially advanced manufacturing jobs, will require additional certificates and associate degrees. Since there is not a trade organization representing manufacturing, an analysis of manufacturing needs should be completed and, as appropriate, training programs should be developed or adapted from other states. Map the specific transferrable skills so employees can either advance in their fields or transfer to other industries.

^{xx} US Census Bureau. Longitudinal Employer-Household Dynamics. “North Dakota’s Beginning of Quarter Employment: Counts by NAICS 3-digis Subsectors and yearly Averages.” NAICS Sectors: 295352, 297884, 299971, 300292, 303015, 308986, 315327, 322584, 328985, 338287, 337570, 346364, 365881, 398836, 413206, 431437, 427644. Accessed 2 December 2016. <http://qwiexplorer.ces.census.gov>

^{xxi} U.S. Census Bureau. Longitudinal Employer-Household Dynamics. “North Dakota’s Beginning of Quarter Employment: Counts by Worker Age and Yearly Averages.” NAICS Sectors – Manufacturing. Accessed 29 November 2016. <http://qwiexplorer.ces.census.gov>

^{xxii} U.S. Census Bureau. Longitudinal Employer-Household Dynamics. “North Dakota’s Beginning of Quarter Employment: Counts by Worker Education and Yearly Averages.” NAICS Sectors – Manufacturing. Accessed 29 November 2016. <http://qwiexplorer.ces.census.gov>

Healthcare

The following section was developed using existing information and data from public sources, through a survey of individuals working in North Dakota healthcare, and through limited interviews. Please review the Information Gathering Methods and Limitations and Caveats of the Findings sections of this report for more information.

Information Gathering Methods

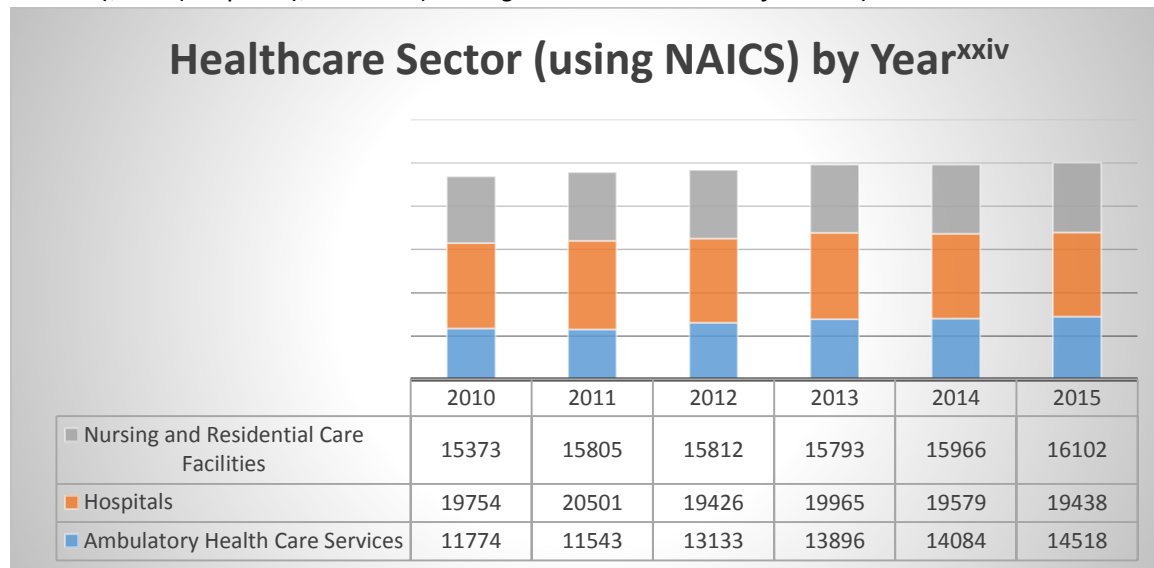
- FHI 360 conducted an informational interview with one healthcare professional and a handful of trade association representatives to help shape the survey and identify secondary sources of data.
- FHI 360 conducted secondary data research, relying heavily on U.S. Census Bureau and Job Service North Dakota. This may or may not be a good representation of needs.
- FHI 360 sent the survey to 107 contacts from 42 organizations. Twenty-one people responded to the survey; however, only seven people answered all open-ended questions. The majority of respondents were human resource managers of large institutions with over 50 employees.

Limitations and Caveats of the Findings

Data are limited by the publicly available data and the small number of responses to the survey. NAICS codes were used to determine the size of the industry and age and education of employees. Standard Occupational Classifications were also used to determine high-growth occupations within the sector. The survey results should be considered anecdotal in nature due to the limited response rates.

Snapshot of Healthcare in North Dakota

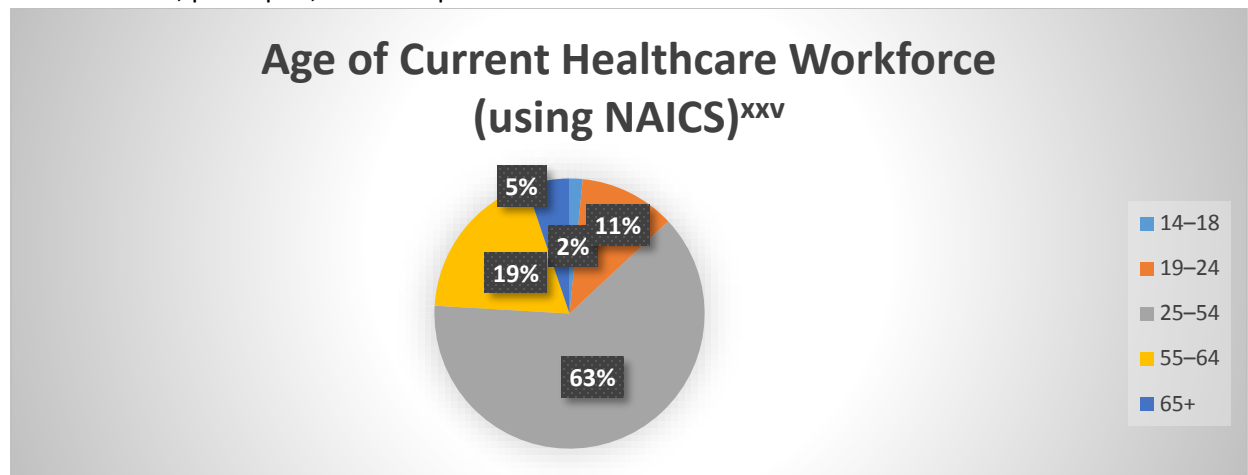
For the purposes of this snapshot, the following NAICS codes were used: 621 (ambulatory health care services), 622 (hospitals), and 623 (nursing and residential care facilities).



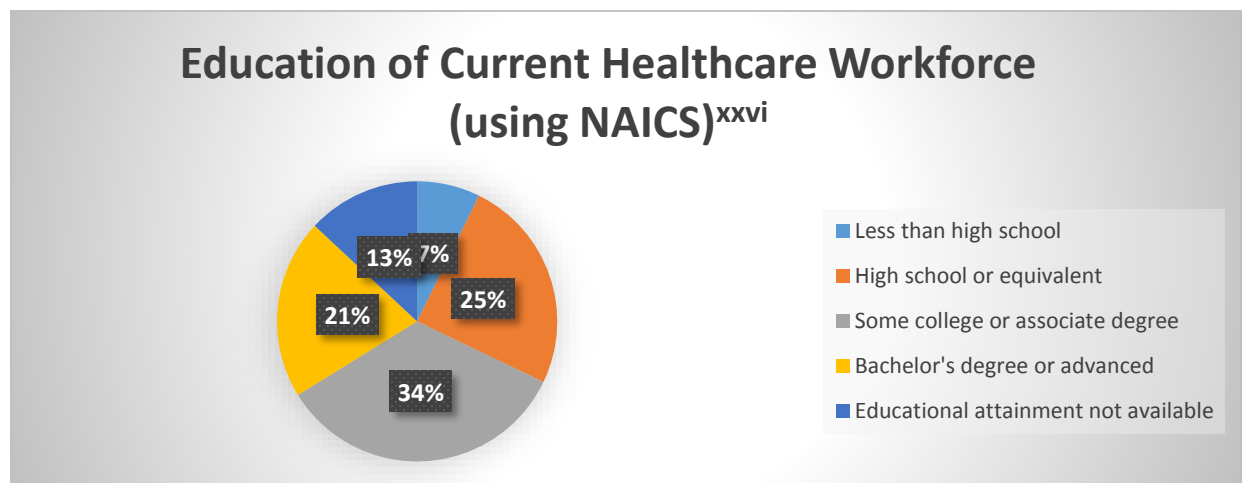
Current Demographics

The following section describes the demographics of individuals currently working in healthcare in North Dakota, as well as education expectations based on surveys, to provide baseline information about the current workforce.

- As of 2015, the majority of healthcare employees (63 percent) were between the ages of 25 and 54. Twenty-four percent were 55 or older.^{xxiv}
- Various trade organizations suggest age distribution of the workforce may not be consistent across the types of facilities and specific occupations; however, it is difficult to compare as data collection tools are not consistent (e.g., occupations requiring more education often skewed older). Distribution of age, occupation, and education was often divided by county, rural vs. urban, per capita, or in comparison to other states.



- Data on the education of the healthcare workforce are divided by specific occupations; however, this is not a good indicator of the essential and specific skills needed in the sector.^{xxv}
- For further information about the current demographics regarding the healthcare workforce, we refer to the pending Fourth Biennial Report of Health Issues for the State of North Dakota. The Third Biennial Report can be found at: <http://www.med.und.edu/about-us/files/docs/third-biennial-report.pdf>.



Anticipated Changes in Demand and Implications for Education/Competencies by 2021

The following section describes expected growth, the education levels and technical and soft skills that survey respondents hoped employees would have by 2021, as well as other information from secondary sources.

Using Standard Occupational Classifications, healthcare occupations that will have the highest rates of growth in North Dakota are as follows.

Occupational Projections (Long-Term) for Highest Demand Healthcare Occupations in North Dakota in 2014–2024^{xxvi}					
	Occupation	2014 Estimated Employment	2024 Projected Employment	Total 2014–24 Employment Change	Total Percent Change
291141	Registered Nurses	8,392	10,442	2,050	24.40%
311014	Nursing Assistants	7,163	8,647	1,484	20.70%
292061	Licensed Practical and Licensed Vocational Nurses	2,923	3,412	489	16.70%
311011	Home Health Aides	1,320	1,687	367	27.80%
292041	Emergency Medical Technicians and Paramedics	1,032	1,338	306	29.70%
292071	Medical Records and Health Information Technicians	901	1,108	207	23.00%
319097	Phlebotomists	589	775	186	31.60%
291171	Nurse Practitioners	445	623	178	40.00%
291123	Physical Therapists	552	725	173	31.30%
292011	Medical and Clinical Laboratory Technologists	655	821	166	25.30%
319092	Medical Assistants	668	831	163	24.40%
291127	Speech-Language Pathologists	580	710	130	22.40%
319091	Dental Assistants	674	803	129	19.10%
291122	Occupational Therapists	410	531	121	29.50%

Occupational Projections (Long-Term) for Highest Demand Healthcare Occupations in North Dakota in 2014–2024^{xxvi}					
	Occupation	2014 Estimated Employment	2024 Projected Employment	Total 2014–24 Employment Change	Total Percent Change
292021	Dental Hygienists	624	744	120	19.20%

Using Standard Occupational Classifications, related occupations will also grow in the next five years.

Occupational Projections (Long-Term) for Highest Demand Healthcare-Related Occupations^{xxvii} in North Dakota in 2014–2024					
Occupation Code	Occupation	2014 Estimated Employment	2024 Projected Employment	Total 2014–24 Employment Change	Annual Avg. Percent Change
119111	Medical and Health Services Managers	843	1,023	180	2.00%
436013	Medical Secretaries	535	663	128	2.20%
291122	Occupational Therapists	410	531	121	2.60%

Survey respondents provided mixed messages about the increased demand for specific positions; however, among those that responded to the question, nearly all agreed that the overall number of workers in the healthcare industry would increase over the next five years. With reduced state budgets and a slower oil economy, demand has slowed; however, the aging population provides an on-going need for more employees.

Changes in Knowledge, Skills, and Abilities (KSA)/Competencies

While the FHI 360 survey had a limited number of respondents, responses to open-ended questions regarding knowledge, skills, and abilities provided some insights.

- While communication was listed as the most important soft skill, respondents also noted time management/ability to prioritize/multi-tasking and compassion/empathy as important soft skills.
- Respondents provided mixed responses to employees’ ability to take on supervisory and leadership positions. (Several individuals skipped the question. Of those that answered, about two-thirds said staff was ready to take on leadership roles.) Respondents provided specific training and areas of expertise that were required for leadership roles, with a particular focus on human resources management, including performance management, conflict resolution, and policies.

- According to survey respondents, staff will need to become increasingly tech savvy with some staff needing to learn data analysis. Other staff will need to learn how to integrate the use of technology (and charting) into providing hands-on care.
- Some respondents highlighted an increased need for management and data analysis positions due to increased regulations; however, we consider this anecdotal until other biennial reports are released.

Healthcare Findings and Recommendations

Findings

- **Finding:** The healthcare sector will continue to experience dramatic shortages over the next five years. The disparity in geographic distribution of physicians and technicians are particularly acute according to industry reports.

Recommendations

- **Recommendation for new entrants:** Encourage the development of a stronger link between high schools and post-secondary institutions, such as Career and Technical Education Programs of Study, with a particular focus on hard-to-fill positions. The development of programs of study, or programs where students earn specific credits during high school that transition to college-level course work, would be desirable.
- **Recommendation:** Identify high demand occupations with a low barrier to entry/relatively little education needed (e.g., personal care aide) and identify transferrable skills required by those "low barrier" occupations to help determine career paths.
- **Recommendation:** Strong sector mapping, consisting of identifying the high demand jobs, the location of those jobs, the pipeline of individuals exiting and entering those jobs, as well as the training pipeline, could help current healthcare staff grow within the sector.

^{xxiii} U.S. Census Bureau. Longitudinal Employer-Household Dynamics. "North Dakota's Beginning of Quarter Employment: Counts by NAICS 3-digit Subsectors and Yearly Averages." NAICS Sectors: 621 (ambulatory health care services), 622 (hospitals), and 623 (nursing and residential care facilities). Accessed 30 November 2016. <http://qwiexplorer.ces.census.gov>

^{xxiv} U.S. Census Bureau. Longitudinal Employer-Household Dynamics. "North Dakota's Beginning of Quarter Employment: Counts by Worker Age and Yearly Averages." NAICS Sectors: 621 (ambulatory health care services), 622 (hospitals), and 623 (nursing and residential care facilities). Accessed 30 November 2016. <http://qwiexplorer.ces.census.gov>

^{xxv} U.S. Census Bureau. Longitudinal Employer-Household Dynamics. "North Dakota's Beginning of Quarter Employment: Counts by Worker Education and Yearly Averages." NAICS Sectors: 621 (ambulatory health care services), 622 (hospitals), and 623 (nursing and residential care facilities). Accessed 30 November 2016. <http://qwiexplorer.ces.census.gov>

^{xxvi} Labor Market Information Center. Job Service North Dakota, Projections Unit. "Occupational Projections (Long-term) for Multiple Occupations in North Dakota in 2014–2024." (Occupation codes: 290000, 390000, 310000, 291141, 311014, 399021, 292041, 292071, 119111, 291171, 291123, 319092, 291127, 436013. Note: Other codes were referenced, but only codes that anticipate an employment change of 100+ were included in the table.) Accessed 30 November 2016. <https://www.ndworkforceintelligence.com>

^{xxvii} Labor Market Information Center. Job Service North Dakota, Projections Unit. "Occupational Projections (Long-term) for Multiple Occupations in North Dakota in 2014–2024." (Occupation codes: 290000, 390000, 310000, 291141, 311014, 399021, 292041, 292071, 119111, 291171, 291123, 319092, 291127, 436013. Note: Other codes were referenced, but only codes that anticipate an employment change of 100+ were included in the table.) Accessed 30 November 2016. <https://www.ndworkforceintelligence.com>

Agriculture

Agriculture was not originally included as one of the fast-growing sectors identified by WEAC. However, the group elected to add publically available data about agriculture to the report as it is an essential element of North Dakota's economy. No recommendations were made for this sector.

Information Gathering Methods

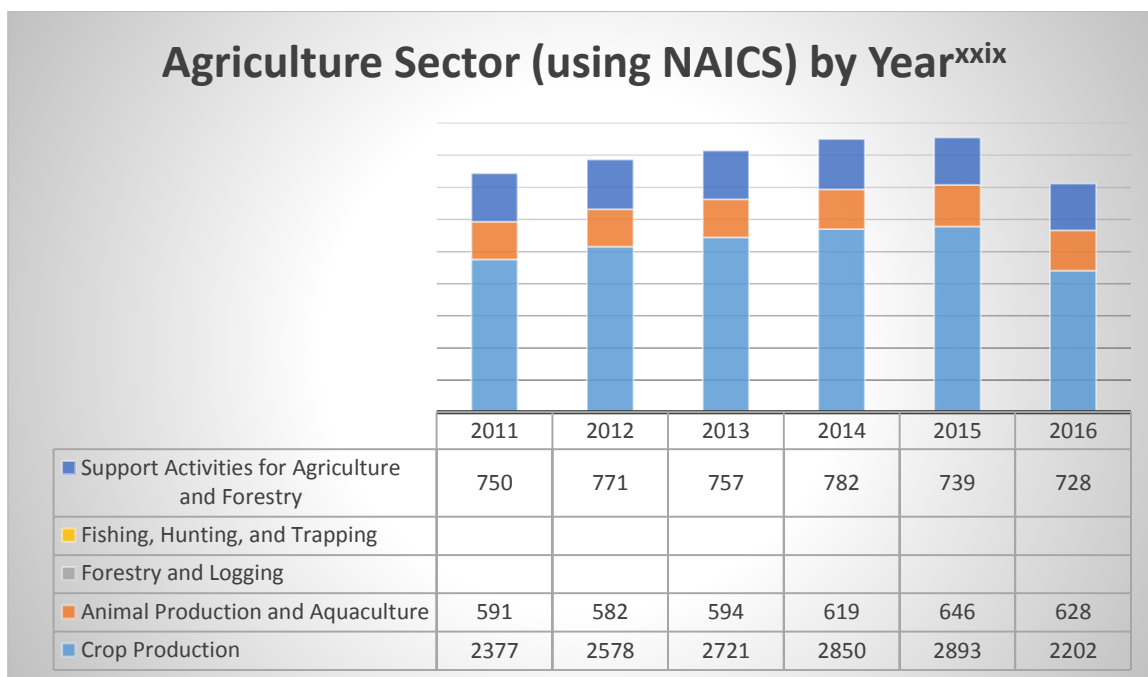
FHI 360 conducted secondary data research, relying heavily on U.S. Census Bureau and Job Service North Dakota. This may or may not be a good representation of needs.

Limitations and Caveats of the Findings

The agriculture report is not intended to be comparable in depth to the other industries, but rather provide general information about the size and scope of agricultural employment in North Dakota.

Snapshot of Agriculture in North Dakota

For the purposes of this snapshot, the following NAICS codes were used: 111 (crop production), 112 (animal production and aquaculture), 113 (forestry and logging), 114 (fishing, hunting, and trapping), and 115 (support activities for agriculture and forestry).



Using Standard Occupational Classifications, agriculture occupations will change in the following ways.

Occupational Projections (Long-term) for Agriculture Occupations in North Dakota in 2014–2024^{xxix}

Occupation Code	Occupation	2014 Estimated Employment	2024 Projected Employment	Total 2014–24 Employment Change	Annual Avg. Percent Change
450000	Farming, Fishing, and Forestry	6,922	6,923	1	0.00%
452091	Agricultural Equipment Operators	860	949	89	1.00%
452011	Agricultural Inspectors	260	283	23	0.90%
452099	Agricultural Workers, All Other	106	103	-3	-0.30%
452021	Animal Breeders	28	28	0	0.00%
452092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	3,889	3,806	-83	-0.20%
452093	Farmworkers, Farm, Ranch, and Aquacultural Animals	971	949	-22	-0.20%
451011	First-Line Supervisors of Farming, Fishing, and Forestry Workers	186	169	-17	-1.00%
454011	Forest and Conservation Workers	207	245	38	1.70%
452041	Graders and Sorters, Agricultural Products	378	357	-21	-0.60%

^{xxviii} U.S. Census Bureau. Longitudinal Employer-Household Dynamics. “North Dakota’s Beginning of Quarter Background Information.” Employment: Counts by NAICS 3-digit Subsectors and Yearly Averages.” NAICS Sectors: 111(crop production), 112 (animal production and aquaculture), 113 (forestry and logging), 114 (fishing, hunting and trapping), and 115 (support activities for agriculture and forestry). Accessed 29 December 2016.

<http://qwexplorer.ces.census.gov>

^{xxix} Labor Market Information Center. Job Service North Dakota, Projections Unit. “Occupational Projections (Long-term) for Multiple Occupations in North Dakota in 2014–2024.” (Occupation codes: 450000, 452091, 452011, 452099, 452021, 452092, 452093, 451011, 454011, 452041.) Accessed 29 December 2016.

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About FHI 360

FHI 360 is a nonprofit human development organization dedicated to improving lives in lasting ways by advancing integrated, locally driven solutions. Our staff includes experts in health, education, nutrition, environment, economic development, civil society, gender, youth, research, technology, communication, and social marketing—creating a unique mix of capabilities to address today's interrelated development challenges.

FHI 360's National Institute for Work and Learning (NIWL) promotes the integration of education and employment systems to ensure lifelong learning and productivity for all. Working with foundations, state agencies, school districts, institutions of higher education, businesses, community-based organizations, and the workforce system NIWL fosters collaboration among and across sectors through research and evaluation; program development; policy analysis; training and technical assistance; partnership building; and information sharing.

Report Authors

Stephanie Davison

Stephanie Davison, M.P.A., is a program manager in FHI 360's National Institute for Work and Learning. Ms. Davison leads and coordinates a range of projects supporting the education-workforce pipeline. As a program manager, Ms. Davison guides and coordinates the design, management, coordination, and implementation of programs. In particular, Ms. Davison directs an assessment of the education-workforce pipeline for particular technical jobs in North Dakota's oil patch. She also provides technical support and expertise to workforce projects focusing on health and retail careers. Further, Ms. Davison led a corrections project for the U.S. Department of Justice, which supported the dissemination of best practices in the fields of energy corrections practices and training and reentry programs. Ms. Davison has also served as a research associate for U.S. Department of Labor and Education projects. Before she joined FHI 360, Ms. Davison worked in a variety of capacities supporting youth development and training programs.

Ivan Charner

Ivan Charner is the Director of FHI 360's National Institute for Work and Learning. He is a domestic education and workforce development specialist with over 40 years of experience in the design, development, and management of projects and programs dealing with educational policy, teacher education and professional development, college and career readiness, workforce development, and systemic reform. He works with state and local school systems, higher education institutions, corporations, government agencies, and community-based organizations to integrate and improve education, training, and career-related systems. Mr. Charner's areas of expertise include career and technical education; teacher preparation and professional development; school-to-career system building; school reform; curriculum integration; school-business partnerships; work-based learning; and adult education and training. He designs and conducts training workshops, seminars, and conferences, is a regular presenter at the American Association of Colleges of Teacher Education, and has written extensively on teacher preparation and effectiveness, youth transition from school to career, school

reform, college and career readiness issues, instructional coaching, career and technical education, and school-business partnerships.

Caitlin Rose Dailey

Caitlin Rose Dailey, M.A., is currently a program manager and qualitative researcher for FHI 360's National Institute for Work and Learning (NIWL) with nearly 10 years of experience in U.S. education and workforce development. She has demonstrated experience in qualitative data collection and analysis of education reform efforts in schools, intermediary units, and universities. Dailey is also experienced at reporting for diverse audiences including government agencies, foundations, professional associations, and the general public. She has led qualitative data collection and analysis efforts for state-level reform initiatives in Pennsylvania and North Dakota. Dailey co-directed the Teachers for a New Era (TNE) Learning Network, a consortium of 30 university teacher preparation programs dedicated to innovation in teacher education. Before joining FHI 360, Dailey served as a graduate teaching assistant at The George Washington University and completed research and public programming internships at the Smithsonian Institution's National Museum of Natural History and at San Francisco Maritime National Historical Park.

Eleanor Wang

Eleanor Wang, M.A., has seven years of experience in research, monitoring, and evaluation using quantitative and qualitative data analysis. She works on projects related to secondary and post-secondary education, college and career readiness, economics, and workforce development. Her skills include data collection and analysis; interviews and focus group discussions; technical report writing; and research and literature reviews. She has evaluated the impact of college and career readiness programs for youth, and written numerous reports on the relationship between skills, workforce development, and education. Currently, Ms. Wang monitors and evaluates a U.S. Department of Education Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP) grant and evaluates the economic impact of a USAID-funded agriculture finance project and assesses USAID-funded YouthPower Action, a youth workforce development program.