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Title: *A Qualitative Look at One-Year Manufacturing Program Students'*

Perceptions of Manufacturing, Work Values, and Enrollment Decision

Factors

The accompanying research report is submitted to the **University of Wisconsin-Stout, Graduate School** in partial completion of the requirements for the

Graduate Degree/ Major: EDD in Career and Technical Education

Research Advisor: Dr. Debbie Stanislawski, Professor

Submission Term/Year: Summer 2017

Number of Pages: 185

Style Manual Used: American Psychological Association, 6th edition

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Gamer, Joshua J. *A Qualitative Look at One-Year Manufacturing Program Students' Perceptions of Manufacturing, Work Values, and Enrollment Decision Factors*

Abstract

Manufacturing is a driving force of our economy and has transformed from low skill occupations to occupations focused on the utilization of technology resulting in a higher skill requirement. A combination of retirements within industry and a lack of interest among the future workforce are creating a worker shortage within manufacturing. Current literature does not offer insights into why students do select manufacturing as an occupation and what they value in work. This qualitative study used focus groups to identify students' perceptions of manufacturing, the work values they hold, and who and what influenced them to select a specific manufacturing based occupational program. Participants were students presently enrolled in the short-term manufacturing based programs of welding, CNC, and industrial electronics maintenance. Findings indicate the even among those who chose manufacturing as a career, negative paradigms of manufacturing still exist. A common set of work values also exists for focus group participants. Students are strongly influenced in their career direction by parents and teachers. Experiences, both at home and at the secondary school level are a contributor to career choice and therefore collaboration among secondary, post-secondary, and business is needed to foster additional interest.

Acknowledgments

I wish to start by thanking my family for your continued support and encouragement. To my wife, Kristin, you have graciously taken on additional parenting responsibilities so that I could focus on my research while also pushing me to keep moving forward. You understood when I was rarely available for family events or spousal courtship. Thank you! To my children, Lillian and Skyler, you also sacrificed time with me so that I could complete this and went without vacations at times in hopes of better things to come later. I thank you for your maturity and understanding beyond your years.

I wish to thank my committee chair, Dr. Stanislawski, who asked the hard questions of me during the process and provided exceptional guidance. I felt supported in these interactions and was able to rely upon you for expeditious and thoughtful feedback. I could not have asked for a better chair.

To my committee Dr. Rothaupt and Dr. Keyes: I wish to thank you for helping me to frame those first three chapters to start this study off right and for providing your time even though it came right as you were at your busiest preparing for the new term. Your input on the presentation of findings also made this paper much better. Thank you.

To the students who agreed to participate in this study: I thank you greatly. You agreed to give up your personal time to share your feelings with me and were a joy to work with. Without your willingness to participate, this study would not have been possible.

To my employer Western Technical College: The financial support and flexibility you provided was exceptional. I never had to worry about the value you found in me pursuing this or about being able to adjust my schedule as needed to facilitate its completion. The personal support of my colleagues and supervisors will not be forgotten.

To my fellow classmates: You made this fun. I learned a lot from each of you and the strong cohort made completion much more feasible. I wish all of you luck in your future and know that you will do very well.

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Chapter I: Introduction

According to Hessman (2015), for every direct manufacturing job, it is believed that 2.2 additional jobs are created. This makes manufacturing a direct driving force of the United States (U.S.) economy. Although the U.S. has lost almost five million manufacturing jobs (Dietz & Orr, 2006), adoption of new technology has helped the U.S. to remain the most productive in the world (Brown, 2012). The new technology has changed the manufacturing environment to be one which is more focused on science, technology, engineering, and math (STEM) (Hessman, 2015). A STEM focused industry however means that there is an increased need for higher skills among employees.

Offshoring, once thought to be a potential threat leading toward the elimination of manufacturing in the U.S., now may soon see a decline. During the downturn of the 2000s, the U.S. saw a loss of one-third of all manufacturing jobs (Moberg, 2013). Manufacturers typically offshore manufacturing based on an effort to increase speed of delivery, to reduce manufacturing costs due to cheaper labor, or to offer innovation to otherwise undeveloped countries (Da Silveira, 2014). The reality that many manufacturers are seeing however is that speed of delivery may actually add costs due to shipping, and communication issues. Due to this and other reasons, some manufacturers are now looking at slowing offshoring and even on-shoring instead (King, 2014; Lee, 2014; Moberg, 2013). As less jobs move out of the country and more begin to move back, the labor force within the U.S. will need to be able to accommodate.

No longer are the jobs within manufacturing like those in the 1930s and 1940's when they could be categorized as dangerous, dirty, dead-end, unskilled, and a lot less exciting (Bates, 2007; ReWeick, 2014). The jobs of today contain wages, and career paths, exceeding many other industry sectors (U.S. Department of Commerce, 2015). This contradicts a concern among

some of the population that they lack career potential and are dead-end positions (ReWeick, 2014). To be hired however it is acknowledged that students will need more than a high school education (Salopek, 2007).

Manufacturing companies around the world are or will be facing a skilled worker shortage (Brown, 2015). Through 2025, half of the estimated 3.5 million job openings will go unfilled (McMenamin, 2015). This may be in part due to the large forthcoming number of retirements. Not only will companies be faced with trying to grow their employee base, they also will be working to simply replace the masses that will be retiring (Fehrenbach, 2014).

Automation technology has brought some relief and productivity increases by automating basic and advanced processes (Christian, 2013; Gold, 2016). A robot can now perform a task, which once took a physical worker to perform. Technology itself though is not fully replacing the workforce, and access to a highly skilled workforce is perceived as one of the largest threats to manufacturing (Christian, 2013). Robots can, instead, supplement a workforce that is already having challenges filling positions (Postlethwaite, 2014). The increase in automation technology is driving the need for higher computer and design skills to build, maintain, and control robotic cells.

The combination of increasing skill requirements for employees and the impending retirements make it essential that post-secondary career and technical education (CTE) institutions do what they can to ensure a viable labor pool. According to Rothwell, “CTE programs are a viable labor pool for STEM jobs not requiring a bachelor’s degree” (as cited in Konopnicki, 2014, p. 29). To accomplish this, post-secondary CTE institutions must understand why students select or do not select their programs as a vehicle from which to obtain one of these jobs.

Recent work at Moraine Park Technical College turned around a downward trend of enrollments within their manufacturing based occupational programs (Jorgenson, 2005). After finding that students viewed manufacturing related occupations as low wage, assembly line style jobs, they were able to achieve a 15% gain in enrollments compared to the previous decline of 34%. Similarly, nursing occupations have suffered previous negative perceptions as being viewed as over-worked, under-paid, and subservient to doctors (Brodie et al., 2004; Jansen & Vetter, 2015). This realization came about after focus groups were conducted to understand the beliefs of incoming students. Focusing on students who select a short-term occupational program within CNC, welding, and maintenance could allow for a better understanding of why they selected their specific program, what biases they hold, and what they value in a career.

Much research has already been conducted surrounding why students select their specific occupation program, and the majority of findings all point to these students having a set of expectations or values (Super, 1962; 1975), associated with a career, specific goals (Lent, Hacket, & Brown, 1995), and how they will fit into the job (Dawis, Loftquist, & Weiss, 1964; Holland & Gottfredson, 1975; Lent & Brown, 1996, Lent & Hacket, 1999). None of this seminal work however looks specifically at students entering a specific occupational program. Later works have adopted these theories to explore enrollment in healthcare and hospitality, but none have focused exclusively on one-year, manufacturing occupational programs.

Statement of the Problem

Little is known as to why students select a career within manufacturing. The primary purpose of the Wisconsin Technical College system is to develop the human skills to make an economic impact. Local manufacturing employers are reaching out to colleges for employees while colleges have excess capacity in some manufacturing programs due to a lack of enrollment

by students. The apparent mismatch of a student's desire to enroll in a specific program and the programs where high job demand exists could prove problematic for the future workforce needs.

The current and predicted future jobs will require some level of post-secondary education, so it is essential to understand how and why students are selecting or not selecting their degree program in manufacturing. Understanding any negative perceptions associated with manufacturing careers, what student's value within a job, and what influenced them to select their occupational program, could help to increase enrollments going forward.

Purpose of the Study

The primary purpose of this study was to identify why students selected their specific post-secondary, short-term credential, manufacturing based career program, their perceptions of manufacturing, and what they value in work. By understanding influences, both positive and negative, it is hoped that it helps to inform future marketing efforts and help administrators in decision making related to raising enrollments in those programs. By understanding the factors that affect student enrollment and identifying what the future workforce values in a job, it could also help local manufacturing companies promote their open positions by reviewing how they structure the work and career opportunities within their place of employment.

Research Questions/Objectives

The following questions aim to understand why students select their specific career program:

1. What perceptions of manufacturing exist among those currently enrolled in a one-year manufacturing-based career program at Western Technical College (Western)?
2. What do students currently enrolled in a one-year manufacturing-based career program at Western value in a job?

3. Why did students who are currently enrolled in a one-year manufacturing-based career program at Western select that program?

Methodology

To answer the research questions, a qualitative research method was deployed using focus groups to gather data. Purposeful and convenience sampling was used to select participants for one of four focus groups. The focus groups were conducted with students currently enrolled in the CNC, welding, and industrial electronics maintenance programs. Specifically, a list of open-ended interview questions was created and a standard interview protocol was followed.

Significance of the Study

While businesses in the manufacturing sector struggle to attract new workers, some manufacturing sector CTE programs sit with the capacity to serve more students. Placement records at one mid-western technical college indicate that the number of past graduates either employed within their field or furthering their education hovers above 85% (Western Technical College, 2016). Still, some programs are enrolled at less than 50% of capacity while others are at capacity with wait lists. In order for employers and colleges to recruit and retain individuals within manufacturing based careers, an understanding of what these individuals value and why they selected their specific program is essential.

While looking at secondary schools, interest in CTE programs is low to moderate (Haney, 2002). This makes understanding current post-secondary students decisions to enroll even more valuable. With marketing and recruitment dollars limited, listening to currently enrolled students has yielded valuable information about how to promote these programs and overarching occupations to future students.

The current demographic of students enrolled in Western's manufacturing programs is predominantly male. This aligns with the national trend of women representing only 25% of the employees within manufacturing (Bond, 2013). Those who have selected manufacturing as a program choice could provide valuable insights into ways to increase female enrollments. Much research has been done on factors that influence students to select traditional educational programs; however, there appears to be a gap when it comes specifically to short-term, manufacturing programs. This study helped to inform if the decisional factors and influences are different for this population.

Assumptions of the Study

The study assumed the following:

- Students enter a program of study holding specific values associated with their career goals.
- Students entering a manufacturing focused academic program have selected to do so based on specific influences while at the same time, there is still a negative perception surrounding manufacturing based occupations.
- The number of students selecting manufacturing careers is not sufficient to meet the future demand, and enrollment in post-secondary education will be a pre-requisite of the majority of manufacturing jobs in the future.
- Student participants provided honest answers during the research process, which allowed an analysis to arrive at an understanding of why students enroll and help to counteract the shortage.

Limitations of the Study

The greatest limitation of this study was identifying the independent variables associated with program selection. While previous research exists to guide work values categories, the studies have been mostly focused on hospitality and healthcare (Chak-Keung, & Jing, 2009; Dobson, Gardner, Metz, & Gore, 2014; Lee, Olds, & Lee, 2010). None of these studies included a more in-depth analysis to determine other factors that influence the desire to enroll, specifically within a short-term, manufacturing based occupational program of study.

Additionally, population and sample sizes were small due to the limited size of many manufacturing programs in comparison to healthcare and hospitality programming. This study will however provide for a base study, which through replication elsewhere could lead to greater generalizability. With females being underrepresented in manufacturing, obtaining female representation within the sample was not possible, which limited the results of this study being specifically applied to females.

Definition of Terms

The following terms are defined to aid in this study:

Advanced manufacturing. According to the President's Council of Advisors on Science and Technology (2012), "a family of activities that (a) depend on the use and coordination of information, automation, computation, software, sensing, and networking, and/or (b) make use of cutting edge materials and emerging capabilities enabled by the physical and biological sciences, for example nanotechnology, chemistry, and biology. It involves both new ways to manufacture existing products, and the manufacture of new products emerging from new advanced technologies" (p. 1.).

Bright outlook occupations. According to the Department of Labor's O*Net database (2016), these occupations are expected to grow quickly in the next several years, will have many job openings, or are new and emerging occupations.

Career clusters. A conceptual framework to organize and convey information about CTE offerings (Blosveren, 2015).

Career pathways. According to the U.S. Department of Education, Health and Human Services, and Labor (2012), career pathways are “a series of connected education and training strategies and support services that enable individuals to secure industry relevant certification and obtain employment within an occupational area and to advance to higher levels of future education and employment in that area” (p. 1.).

Manufacturing careers. According to Wisconsin Career Pathways (n.d.a) “Careers in manufacturing involve planning, managing and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering” (n.p.).

Program of study. Programs of study are sequenced instruction that provides preparation for a career. This may include coursework, co-curricular activities, learning related to service projects, on the job experiences, and other learning experiences (Wisconsin Career Pathways, n.d.b).

Social cognitive career theory (SCCT). SCCT focuses on the variables of self-efficacy, outcome expectations, and goals and their interaction with the environmental factors in the context of career development. It looks at the process through which people form academic and occupational interests, make educational and occupational choices, and achieve varying levels of success in school and work (Lent et al., 1999).

Work values inventory (WVI). Work values are defined as the internal and external motivators an individual holds about the career they select (Super, 1962).

Chapter II: Literature Review

The primary purpose of this study was to identify why students selected their specific post-secondary, short-term credential, manufacturing based career program, their perceptions of manufacturing, and what they value in work. By understanding influences, both positive and negative, it is hoped that it will help to inform future marketing efforts and help administrators in decision-making related to raising enrollments in those programs. By understanding the factors which affect student enrollment, and identifying what the future workforce values in a job, it could also help local manufacturing companies promote their open positions by reviewing how they structure the work and career opportunities within their place of employment.

Why individuals select specific occupational roles has been a subject of study for decades. The selection of a career not only provides a person with a source of income necessary for everyday life; it can also become synonymous with the identity of an individual to those looking in. However, understanding the decision-making process and influences on the decision is a complex endeavor.

Theory Base

This study drew upon a combination of career development theories to explore the underlying reasons students select to enroll in a specific manufacturing based one-year post-secondary occupational program. The underlying theory base begins with Super's work values concept, which theorizes that all employees enter the world of work with a set of expectations regarding what they will get out of a job. This study further recognizes that student's personal experiences form their beliefs in their abilities, which, in turn, affects their goals and expected outcomes. Social cognitive career theory (SCCT) suggests then that exploring the beliefs held

by these students regarding manufacturing occupations could shed light upon why they enroll despite a potential negative image associated with manufacturing-based occupations.

Life Stages

Looking further back within the literature, one can find the seminal work of Donald Super. Super argued that there are distinct stages in life, which are accompanied by societal expectations: growth, exploratory, establishment, maintenance, and decline. The author defined the growth stage as the time in a child's life where their exposure to specific people and specific environments provide for experiences, interests, etc., which at a later point in life, may become important. At this stage, these influences begin to shape the values and self-image of the youth. Different exposures may either reinforce or discourage particular interests, thus the selection process may be viewed as an emotional response, rather than a deliberate thought process (Super, 1975).

The second stage, exploration, begins very early on and it continues throughout life. At this stage, experiences occur which allow the person to test out or get a feel for specific occupations. When we look at career academies of today, they are aligned with the exploratory stage of development. It is an opportunity for the youth to explore if they have a desire or natural ability within different career fields. A strong ability may build upon interest while a lack of ability could lessen interest. Even those in adulthood may find themselves in a new role or organization which does not meet their skill-set or interest. In these cases, it is expected that the adult will keep exploring until they find a better fit for themselves. In a different example, an adult may take on a new opportunity which they find interest in and excel at. It may otherwise have not previously occurred to them that it was a credible career option. With the success and interest mounting, the adult may choose to continue that career path (Super, 1975).

Eventually, it is believed that one needs to stop exploring and instead begin to establish themselves within a career. This can take a few years or as long as a decade. The establishment stage should be viewed as the success on the other side of the exploring stage. Here, one settles in to the career they have selected. While they may undertake several different jobs, most would be related and add to the overall career (Super, 1975).

With the establishment stage also comes the maintenance stage. There comes a time when a person may feel the need to reaffirm their decision through additional exploration although they may be settled into a career. It could also be a time when the person pushes to maintain a sense of value against a younger workforce working with them. In either case, it would seem that this stage of development would mark the mid-career of the worker. Perhaps, the midlife crisis term, which is often put out there for those in their 40s and 50s would be connected (Super, 1975).

Super (1975) identified women as going through this at a younger age than men. The woman as the key child caregiver at that time could play into this. However, digging further into the idea of generational differences among genders, we may find that this does not hold true today. In addition, with more people working longer and working more jobs, it is possible that re-exploration occurs much more frequently through the careers of the worker today.

Super's last stage of development was related to the ending of the career stage for individuals. In the declining stage (Super, 1975), one typically finds themselves withdrawing from the workforce to a lesser activity level or all together. He does note however, that when one can carry over with them to retirement the same types of activities that they are often happier than those who cannot.

Super's Work Value Inventory

Work values are defined as the internal and external motivators an individual holds about the career they select. To ascertain what these motivators are, Super (1962) developed the work values inventory (WVI) which consists of paired items to measure 15 different work values. The predetermined values measure whether or not an individual's motivational factors are internal or external. According to Super, internal values include altruism, creativity, independence, intellectual stimulation, esthetics, achievement, and management. External factors include way of life, security, prestige, economic returns, surroundings, associates, supervisory relations, and variety. There are some inconsistencies as to what qualifies as internal or external.

As Vodanovich, Weddle, and Piotrowski (1997) pointed out, intrinsic work values are recognized by internal satisfaction from work while external factors are often recognized by a drive for income. Although Super (1962) classified the work value of variety as being external, if the desire for variety has to do more with a desire to grow or to be engaged rather than to earn more money or job advancement, it could be classified as internal.

Zaccaria, Jacobs, Creaser, and Klehr studied the reliability of these values in a study of high school and college students and found relatively stable scores (as cited in Leuty, 2013). Although there has been some debate, as Rounds and Armstrong (2005) argued, there is limited evidence supporting the reliability of individual work values. As individuals age, particularly beyond college age, the work values have been shown to be more stable (Jin & Rounds, 2012; Rokeach, 1973). It is important to note that the college age of the Jin and Rounds sample was considered to be ages 18-22. Once in the workforce, extrinsic values increased as compared to valuing intrinsic things while in college (Jin & Rounds, 2012).

Super's Work Values Inventory-Revised

Super's work value inventory while established, is utilized in different formats. The original fifteen classifications were later scaled back on due to overlap with three dimensions of the Kuder model (as cited in Robinson & Betz, 2007). Altruism, esthetics, and management present in Kuder's model were removed, leaving the values of achievement, creativity, co-workers, income, independence, life-style, mental challenge, prestige, security, supervision, work environment, and variety. Robinson and Betz established the validity and reliability of the measure of work values in career development.

Minnesota Theory of Work Adjustment

Building on the work of Frank Parson's, the Minnesota theory of work adjustment (MTWA) started with the premise that when looking at vocational fit and choice, one should look at the person themselves and the job itself to determine what fit occurs (as cited in Dawis et al. 1964). Highly reminiscent of later work by Lent and Brown (1996) and Lent and Hackett (1999), MTWA looks at how as an individual grows, so does their abilities and needs. It also appears to be a precursor to Holland and Gottfredson's (1975) typology theory whereby the newly developed needs are no longer met by the job opportunities, thus an incongruence occurs causing career dissatisfaction. Unlike later work however, the MTWA focuses on success throughout a job as opposed to successfully selecting a specific vocation.

An individual's happiness at work is determined by how satisfied the worker is of the work environment and how well the environment is benefitting from them. MTWA also describes how the individual's work personality is derived from their personality structure (i.e., abilities and needs) and personality style, which looks at how they interact with their own environment. By examining flexibility and activeness versus reactivity, celerity, pace,

rhythm, and perseverance, personality style is determined (Dawis & Lofquist, 1981). In essence, the MTWA follows a similar path to Super where a work fit is determined through the creation of values and environmental fit.

Chaos Theory of Careers (CTC)

As the name suggests, CTC focuses on the many different aspects within life that occur simultaneously. These varying forces are at work continuously affecting decisions and actions each day. In its most simple form, chaos theory can be described as career development within complex systems. In other words, how one selects a career amid all of the influences and potential directions (Bright & Pryor, 2011).

Chaos theory is based on four distinct pillars: complexity, change, chance, and construction (Bright & Pryor, 2011). Complexity speaks to the fact that no one influence has a straightforward effect. The influence of a parent, for example, although strong, changes over time. It is therefore a complex variable that cannot be predicted. The second pillar, change, is a constant within all of our lives. In terms of career direction, change within our lives can quicken us towards certain decisions, slow us, or even completely turn us around. Change itself is an influence that occurs simultaneously with all other influences. As a result, the effect of an influence is only as strong as the context of the other change occurring at that time.

The last two pillars, chance and construction, actually appear diabolically opposed but are in fact interconnected. Chance speaks to the idea that one does not have control over things, and systems can by chance go one way or another. In essence, an experience may arise by chance yet provide an opportunity for which we find fruitful. This is where construction comes in. Using construction as a pillar, we think of career development as the process by which one

makes their decisions. Taking into account the three previous pillars, all of the apparent instability can now turn to stability by our own hand (Bright & Pryor, 2011).

While chaos theory may sound random for a sound theory, it is the randomness of it which defines it. Instead of a straightforward cause and effect, it is a framework from which we can examine other theories for missing components. By design, this theory intends to remove the well-defined borders that can limit other theories.

Social Cognitive Theory (SCT)

SCT is centered around the idea of self-efficacy. When individuals believe they have control to act, they are more likely to do so (Bandura, 1997). Likewise, if situations feel out of one's own control, they are less likely to act. In relation to career intention, it could be argued then that once a person believes they can do a specific career, they are more apt to pursue it.

Perceived self-efficacy is a regulating factor within the human life. It will regulate one's cognitive functions, motivation, affect, and depression (Bandura, 1997). A high self-efficacy may play out cognitively by people setting high expectations of themselves and their careers. Likewise, low self-efficacy may result in someone doubting their own capabilities and never truly challenging themselves. With high self-efficacy also comes an increased level of motivation to achieve the goals set forth. When challenges arise, they are also able to manage them and not allow them to overtake them. If a student with high self-efficacy takes an entrance exam for an academic program and scores low, they are not deterred and can easily develop a plan to move forward. They exercise control over their environment by the ability to think through the needed responses and garner additional support from the environment around them.

Self-efficacy is not however only influenced by one's own experiences. Social modeling may also play into the belief of one's own self ability (Bandura, 1997). For a student who's

parents struggle in their own occupation, or who have not gone on to obtain further education, the belief that they themselves can be successful in that occupation or in higher education may be a challenge to overcome. In this context, the environment also influences self-efficacy.

Social Cognitive Career Theory (SCCT)

SCCT is an attempt to build upon the work of Bandura while bridging the divide among previous career development theories (Lent & Brown, 1996; Lent & Hackett, 1999). Like other career development theories, SCCT attempts to look at factors, which in the end affects an individual's career decision. Specifically, SCCT looks at how self-efficacy, personal goals, and outcome expectations affect career behavior or interest. SCCT is based on the constructivist assumption that people have direct control in influencing their own development through their own experiences within the environment (Lent & Hackett, 1999). They are in essence active participants in the process.

Self-efficacy is the term used to describe the personal beliefs individuals hold about their own capabilities. These beliefs are not formed from a single experience but rather many experiences to include direct personal achievements of the past, vicarious experiences of others, social persuasion, and experienced reactions (Lent & Brown, 1999). Essentially, when someone has a positive experience, it builds self-confidence in related activities. In the context of work, if someone excels in that specific activity, the experience is positive as is the affect on self-efficacy. In contrast, a negative experience or a failure has the potential for the greatest loss of self-efficacy.

The expected outcome of the SCCT model refers to the personal belief of the action/consequence result environment (Lent & Hackett, 1999). In the context of career selection, individuals make judgments relating to the value of going down a specific career path.

These judgments may be from direct experience or from the experience of others who have influence over them. If a negative outcome is expected from attending CTE programs or obtaining a job within the manufacturing sector, there is a reduced chance the individual will partake in such actions.

The final factor of the SCCT model is the personal goal component. These personal goals are the intent of an individual to engage in some activity or to go in a certain direction. When taken into consideration along with self-efficacy and outcome expectation, they can be seen as dynamic, continuously affecting the other. A rising self-efficacy, combined with the belief of an outcome worth pursuing, may in turn lead to a goal which sets the direction of future action (Lent & Hackett, 1999).

SCCT is not completely independent of the work of Super (1962). In both theories, individuals have specific desired outcomes or values of a vocation. Individuals enter a career with an expectation of certain things being true or possible. If a job does not deliver upon these expectations, dissatisfaction may occur.

Holland and Gottfredson's Typology Theory

The Holland theory of vocational type attempts to explain career choice based upon the congruence between one's own personal attributes and the attributes of the environment or career. The career itself, and one's connectedness to it, is a result of one's own choice based upon their efforts to align their career with an environment which is congruent with their typological area and talents. Holland believed that everyone could be categorized into one of six types: realistic, investigative, artistic, social, enterprising, and conventional (RIASEC). Thus, this model assesses environments and people for the attributes correlated to each type in the typology. The comparison is then conducted using a model which places the scores in a

hexagonal pattern, both on the inside and outside. The congruence between the types is then identified by its proximity within the hexagon (Holland & Gottfredson, 1975).

Within the typology RIASEC model, it is believed that individual's type is developed through the positive reinforcement of modeling of behaviors within the environments the person is growing up within. The individual then grows up with these characteristics of a specific typology, which in turn leads to personality traits and a desire to pursue similar occupations. Those holding types congruent with that of their job will be more satisfied than those holding a typology different than that which the occupation offers (Holland & Gottfredson, 1975).

Holland and Gottfredson (1975) also asserted that race, gender, and socio-economic standing affect the development of one's typology. The experiences of individuals in these different classifications are likely to be different; therefore, their development will differ as well. Connected to this idea is the concept that the structure of jobs within the economy does not always provide for an opportunity for people to be employed in congruent jobs. When comparing the concept of incongruence to SSCT, a pattern emerges of the desire to be employed within a vocation which meets the abilities of the individual. When jobs available are thought to be a mismatch between type and ability, the motivation to pursue such jobs is limited (Lent & Hackett, 1999).

Work Value and Career Correlates

When an employee enters a career field, they do so with certain expectations of what they hope to get out of a job. Likewise, even upon retirement, work values are taken into consideration by those looking to become re-involved (Wöhrmann, Fasbender, & Deller, 2016). While attempting to correlate work values with specific career interests has resulted in mixed findings (Dobson et al., 2014), there are several sets of intriguing results. When comparing

intrinsic versus extrinsic values, hospitality students have been shown to hold distinct differences in work values (Chak-Keung, & Jing, 2009). Hospitality workers tend to also place greater importance on extrinsic values.

Also in the Chak-Keung and Jing (2009) study, it was found that the values of altruism, management, aesthetics, and security predict career interest. In a similar study which attempted to connect work values to career types, not a specific career field, gender differences were noted between work values of men and women and their career types. In particular, enterprising type men value management, prestige, economic returns, and security (Tien, 2011).

Similarly, a study of Korean college students found that even within the same career field, a difference of career values exists between genders (Tak, 2004). Given that manufacturing related occupations are predominantly held by males as opposed to females, and that it is segmented into a specific population based on career intent, further examination could show a correlation of specific work values to manufacturing careers due to the relatively homogenous population.

Factors Affecting Career Selection

Beyond specific career development theories, particular factors have been identified, which have been known to influence a student's decision regarding their academic program and career selection. Recent studies have shown that parents and their own career had a significant role in the career selection of students (Ausman, et al., 2013; Chakraverty & Tai, 2013; St, Gean, 2010). Additionally, friends and caregivers have been shown to influence the decisions of students (St. Gean, 2010). Beyond these external influences, students also value items for themselves, which influences the career they select.

Studies have been conducted around nursing, hospitality, psychology, and leadership in an attempt to identify what specific factors students take into account when selecting which program area to select. Findings include both internal and external motivators including convenience of course offerings and delivery method (Larsen, Reif, & Frauendienst, 2012; Winn, Leach, Erwin, & Benedict, 2014;), wages and tuition reimbursement (Larsen et al., 2012), job opportunity, field attractiveness (Lee et al., 2010) and program reputation and structure (Dornfeld, Green-Hennessy, S., Lating, J., & Kirkhart, 2012; Lee et al., 2010). While none of these studies were conducted on two-year students, it may be assumed that these factors may also be evident in other populations.

Skills Gap

Finding qualified workers is a pre-requisite of success to any business operation. At times however finding the right worker with the right set of skills for the specific job desired can be challenging (Boettcher, 2014). Sometimes, the specific skills available in the population do not meet the needs of the jobs, which create a skills gap: the gap between available skilled labor and the needs of the business labor pool. Having a society consisting of educated individuals ready to partake in the workforce and lead our nation is not a new issue, but rather an issue which has been around for decades.

The Russian launch of Sputnik in 1957 is thought to have been the affective precursor to the 1958 National Defense Education Act (NDEA). The NDEA primarily focused on changing education to focus more on science and technology, while providing federal aid to colleges. Additionally, the act's intention was to ensure that as a nation, we have the trained manpower necessary to meet the national defense needs of the country (R. H. E. & Brender, 1959). This

could be viewed as the first attempt to address a perceived skills gap within the society of the U.S.

Continued attention to the potential faults with the U.S. educational system was brought forth again with the publication of *America's Choice*. Marshall (1991) argued that for the U.S. to maintain the accustomed way of life, it would need to take decisive action. The author recommended a state-managed standard skills check-off by age 16, the creation of comprehensive technical programs, an employer funded development of employees, and a consolidated and integrated workforce board to oversee the school-to-work transition. This highlighted an increased call for action. A call grounded in the realization that the U.S. had experienced the slowest wage growth of any industrialized country during the 1980s. Technology and the adoption of it within industry is the way to increase wages.

Furthering the concern over the future of America was the report from the U.S. Department of Education titled *A Nation at Risk*, which revealed that 13% of 17 year-olds in America were illiterate (U.S. Department of Education, 2008). In addition, the report showed test scores dropping and an increased need for remediation in college. Those who would attempt to enter the workforce directly from high school at that time could face problems with being prepared. Those selecting to attend college to obtain additional education would also be at a disadvantage due to needing assistance to reach the level of college readiness. As addressed in the SCANS report, this has placed the U.S. at risk of further decline in the standard of living and overall wages (Packer, 1992). Overall, both secondary and post-secondary schools have a challenge ahead of them.

Adding to the discussion on improving the education system to address projected skills gaps based on a lack of basic skills was the adoption of No Child Left Behind Act (NCLB) in

2001. NCLB has provided a framework for school accountability. President George W. Bush's proposal was largely supported across party lines as a way to ensure every child was ready to succeed upon graduation from high school. To reach that goal, four key components were included:

- **Accountability.** The requirement for every school to report on accountability plans and implement required testing.
- **Funding flexibility.** The ability for states to utilize federal funding based on greatest need.
- **School choice.** An opportunity for parents to pull children from underperforming schools.
- **Teacher instruction.** Improve teaching strategies by focusing on those which have been proven to work (Husband & Hunt, 2015).

As with previous attempts to address skills gaps, NCLB has created controversy over the best way to solve the underlying issue. In 2007, states which did not meet the requirements were granted waivers and an opportunity to put forth their own plan for student success (Husband & Hunt, 2015). In 2010, President Barak Obama signed into law A Blueprint for Reform, which is viewed as an attempt to address problems that arose from NCLB. This program actually was made in response to the American Recovery and Reinvestment Act of 2009. It involves four areas: (1) Improving teacher and principal effectiveness; (2) Providing information to families to help them evaluate and improve their children's schools; (3) Implementing college- and career-ready standards; and (4) Improving student learning and achievement in America's lowest-performing schools by providing intensive support and effective interventions. Among the problems associated with NCLB has been the perception of rewarding lower standards, universal

approaches to solve problems, and a lack of the ability to recognize improvement in schools. The program also moves the conversation in the direction of creating plans for college and careers (U.S. Department of Education, 2011).

After decades of focusing on ensuring an adequately trained labor force, it appears that a gap may still exist. In 2013, a Manpower Group survey revealed that 39% of employers are struggling to find employees (Bessen, 2014). In particular, employers are reporting not finding employees with the needed skills for the jobs available. At the same time, there is still debate as to whether or not a skills gap even exists (Cappelli, 2015).

Defining what is meant by a skills gap appears critical to get at the root of the problem. Skills gap, as a term, has been used to describe several scenarios: a lack of basic skills from the secondary system, a lack of specific job related skills, and an over-under supply of skills for the market place. In any scenario, training for future careers is an ongoing hot button issue.

The Wisconsin Skills Gap

Like other states throughout the United States, Wisconsin is feeling the pressure of a continued skills gap. With education being pursued which does not always align with the needs of the current and future jobs and an overall difficulty in finding and retaining employees, Wisconsin is seen as becoming less competitive. Most problematic for Wisconsin is a shrinking pool of working age individuals being available for jobs. Between 2010 and 2040, it is expected that the number of senior citizens will double while the number of individuals capable of working will increase by only 0.4% (Sullivan, 2012).

Career Training

CTE exists to prepare students for careers upon completion of high school or college (Gentry, Peters, & Mann, 2007). By 2020, it is expected that 65% of all jobs will require post-

secondary education and training beyond high school. Between the years of 2010 and 2020, it is expected that 55 million jobs will be open. Of those jobs, 5 million will require a post-secondary vocational certificate, 7 million an associate's degree, and 10 million will require some college training. Recognizing the value CTE will play in preparing future generations, an examination of how these programs are developed and organized is critical (Carnevale, Smith, & Strohl, 2013).

Career Clusters

Secondary and post-secondary institutions have an abundance of curriculum areas to provide youth and adult students. Conveying the details of the offerings to the public can result in confusion and misunderstanding. Organizing curriculum and connecting it to future workforce opportunities is also challenging. To combat this, it was recognized that a conceptual framework was needed to better organize and convey information related to offerings. In 1972, the Journal of Education published the recommendation of the creation of career clusters based on the following concepts:

- Consist of vocational areas
- Be organized by jobs which are similar in nature
- Be broad in nature
- Include occupations focused on requiring a secondary or two-year post-secondary degree
- Provide both career mobility and relocation mobility (Kutscher, 1972)

Although the earliest suggestion to organize based solely on career areas, which only included a need for vocational education, appears short sided today, much of the suggested framework was eventually adopted.

In the 1970s, the U.S. Office of Education created fifteen career clusters that represented the industry sectors of that time (Blosveren, 2015). The cluster format was further bolstered in 1994 when President Clinton signed the National School to Work Opportunity Act (Granello & Sears, 1999). The school to work opportunity act provided seed money for states to strengthen programs aimed at preparing youth for the high technology and high paying career of the future. The act specifically called for the use of career clusters in relation to work-based learning.

The cluster format received additional support when The Office of Career, Technical, and Adult Education (OCTAE) mandated that career clusters be used in the data reporting for Perkins funding (as cited in Blosveren, 2015). The original 15 career clusters were later changed to incorporate the current 16 now recognized and including agriculture, food and natural resources, architecture and construction, arts, AV technology and communications, business management and administration, education and training, finance, government and public administration, health science, hospitality and tourism, human services, information technology, law, public-safety and corrections, manufacturing, marketing, science, technology, engineering and math (STEM), and transportation, distribution, and logistics (Schmidli, 2001).

Career Pathways

Much as the adoption of career clusters allows us to broadly see what career areas exist, the pathway component of the career cluster allows us to navigate the cluster. Within each categorizing cluster exists a series of specific employment opportunities. These opportunities are comprised of job titles, many of which may have multiple levels within them. According to the U.S. Department of Education, U.S. Health and Human Services, and the U.S. Department of Labor, pathways act to secure employment and advancement opportunities through the use of interconnected training and support services (U.S. Department of Education, 2012).

In Wisconsin, career pathways are defined more by the specific occupations that make up a cluster than by the support services and educational strategies. According to the Glossary of Terms on The Wisconsin Career Pathways website, career pathways are “sub-groupings of occupations/career specialties used as an organizing tool for curriculum design and instruction. Occupations/career specialties are grouped into pathways based on the fact that they require a set of common knowledge and skills for career success” (Wisconsin Career Pathways, n.d.b, para. 8). Although neither definition is identical, the common feature of both definitions is the specific occupational training opportunities within a cluster which prepares the individual for employment and advancement.

The career cluster and career pathway work is being utilized by secondary schools as a career development tool. As a framework, it allows students to see the possibilities related to different career options and allows them to be better prepared for those careers. The framework has been shown to provide better awareness of options and a higher rate of career planning participation (Stipanovic, 2010). Additionally, in California, it has also been attributed to an increase in CTE enrollments (California Community Colleges, 2014).

Manufacturing Career Pathways

Career pathways within the manufacturing career cluster are divided into six pathways: maintenance, logistics, health, and safety, quality assurance, manufacturing production process development, and production (Wisconsin Career Pathways, n.d.a). Of those pathways, the manufacturing path is the only one to focus solely on the production or creation of a finished product. These occupations include welding and machining, which are represented by a program of study common to every technical college within the Wisconsin system (Wisconsin Technical

College System, 2016). The remaining five paths include occupations that support the production of goods and services or operations of a manufacturing environment.

Each program of study within the manufacturing career pathway can be traced to a specific occupational code through the Department of Labor's website O*Net. The occupational code is a unique number through which a specific occupational job (SOC) is identified and tracked. SOC 51-4121.06 represents welders, cutters, and welder fitters. Similarly, SOC 51-4041.00 represents machinists. Each of these two occupations are identified as having bright futures and high demand jobs of which over 50% will require some form of post-secondary education. A review of the associated work values associated with machining and welding reveal a commonality of support and working conditions. Machining satisfies the independence value; however, it does not satisfy the relationship value as welding does or vice versa (O*Net, 2016).

Image Issues with CTE

CTE at the post-secondary level is one of the primary workforce training vehicles. Unfortunately, signs point to a potential decreased interest in these courses at a secondary level. Overall credit enrollment in CTE courses by high school graduates has declined from 4.2 in 1990 to 3.6 in 2009 (Hussar, Bailey, & National Center for Education Statistics 2016). In the same time period, the total amount of credits in other subjects increased. Kidwai's (2011) study showed that CTE enrollment over the past 10 years has dropped by 30%.

There appears to be a switch away from CTE courses and toward other areas. The areas with the greatest decline are business, manufacturing, computer sciences, engineering, and transportation. Legislative initiatives, image, and perception, are likely contributing to the declining overall enrollment in CTE (Gaunt, 2005). This could prove problematic for future

enrollments in the post-secondary CTE programs as well as the stability of current CTE programs at the secondary level.

While enrollment declines do not directly correlate to a negative image, interest levels could be an indicator of an image problem. CTE interest levels of secondary students' show a low to moderate level of interest (Haney, 2002). Understanding why low-interest exists and identifying potential concerns about CTE programs should be confronted head-on (Holzer, Linn, & Monthley, 2013).

One reason for lower enrollments appears to be the image of who CTE is for. Students who are currently enrolled in CTE courses generally hold a higher view of CTE than those who are not (Browder, 2007). At times, students may believe that CTE is for lower performing students.

Gaunt (2005) reported that students that take more CTE courses have a lower grade point average (GPA) than those students not enrolled in CTE. Later research by Bray (2007) contradicted this. The author's study asserted that students who have taken three or more CTE courses have similar GPAs to those who do not take CTE courses. Brown (2009) noted that there is no difference in grades between CTE students and non-CTE students.

When directly asked who students think CTE is for, again, there are mixed findings. St. Gean (2010) discovered that while 72% of students think CTE is for everyone, they also provide conflicting results by claiming that CTE is for students who struggle (76%). In another study, Abayomi et al. (2013) proclaimed that 55% of students strongly disagree that CTE is for those with lesser academic ability. Although we may not be able to conclude with certainty as Cohen and Besharov (2002) did, that CTE has an image problem, the mixed findings may indicate a potential image problem.

College Enrollment Trends

With the expressed concern over the availability of workers to maintain the economy going forward, college enrollments should shed light on the current state. An initial look at under-represented populations looks promising. Between 2002 and 2012, the number of first-time Latino and Hispanic degree seeking students increased (Kumar, Hurwitz, & College, 2015). For Hispanics, the number doubled during that time when looking at all degree granting institutions. For Blacks, the numbers attending a for profit college quadrupled during that same time period. But upon further examination, the Latino representation at two-year colleges has actually dropped from 54% to 49%. Latino's are attending college at a higher rate, but they are going to four-year institutions at a faster rate than two-year institutions. The same trend can be seen for Black students.

Beginning around 2010, there has been a continual decrease in the overall population of students taking classes at community colleges throughout the U.S. Two-year public institutions have seen the second largest decrease in enrollments in the past couple of years, followed only by for-profit institutions. On average, there has been a consistent 3% drop in community college enrollments. Of significance with this is the faster decline in enrollments of those ages 24 and older coupled with a greater decline in those attending full time (Juszkiewicz, 2015).

From the literature, enrollments at two-year colleges appear to follow the economy with an inverse effect. When the economy is poor, enrollments spike. During the peak of the most recent recession, enrollments at two-year public institutions rose by 22%. With the national unemployment rate dropping below 5% in March of 2016 as compared to the peak of over 9% in 2010, we can see the inverse relationship in play (U.S. Bureau of Labor Statistics, 2016). This relationship can be especially problematic for employers. When the economy is strong, less

people are likely to attend college (Otani, 2014). This makes the immediate availability of employees higher than in a tough economy. At the same time, employers are voicing concerns that they are not able to secure qualified workers. If the number of employees at colleges is low and there is still a shortage in supply of overall workers, there would appear to be either a mismatch of skill-sets or an overall lack of supply of available workers.

Trade Agreements

While trade is commonly accepted as a necessary act, trade may also negatively affect local jobs. Beginning around 1980, governments began pushing for deregulation of trade barriers. Referred to as “free trade investment agreements (FTAs),” the policy movement was meant to make it easier to send and receive products from one country to the next (Ciccaglione & Strickner, 2014). By 1994, the World Trade Organization (WTO) was established as a regulatory body designed to help inform and support agreements between nations (Wells, 2014).

Soon after, the North American Free Trade Agreement (NAFTA) was signed as a tool for promoting fair trade and managing disputes, through de-regulation of trade among Canada, the U.S., and Mexico (Ciccaglione & Strickner, 2014; Kuzeljevich, 2015). Hartman (2011) concluded that NAFTA has been successful in creating increased trade between the three member nations. This is supported by the fact that trade has increased 500% since its passage (Kuzeljevich, 2015). However, Kuzeljevich pointed to the loss of manufacturing jobs in Mexico as a sign that the U.S. and Canada have benefitted more than Mexico. While Hartman (2011), views NAFTA as a success, he does acknowledge that he did not explore the criticisms it has brought regarding the loss of U.S. jobs, foreign investment, and a lack of increasing wages for Americans.

Just as NAFTA was intended to increase the trade ability between The U.S., Canada, and Mexico, the Central America Free Trade Agreement (CAFTA) has been aimed at reducing tariffs between the nations of Costa Rica, Nicaragua, El Salvador, Guatemala, Honduras and the Dominican Republic (Dohnalek, 2016; Ellis, 2005). Like NAFTA, CAFTA can be seen in a positive or negative light. While it too has contributed to the increase in trade among member parties, it also has been seen as having the effect of making exports to countries by the U.S. more challenging than for the other members (Dohnalek, 2016).

Fifty years ago, manufacturing represented 33% of all jobs in the U.S. Today, manufacturing represents just 9% of jobs (Kemeny, Rigby, & Cooke, 2015). As trade policy has been enacted to break down barriers to bring in products and materials, it could be argued that existing trade policy has had some negative effects on U.S. manufacturing. As Cunningham (2012) argued, the greatest losses have come in relation to low technology manufacturing, while one of the greatest bright spots appears to be high technology manufacturing. Oldenski highlighted that the cost effectiveness of producing and selling a product on an open market is dependent on the ability to bring items in and export them back out (as cited in Sullivan & Haltinner, 2016).

Thus, trade legislation and policy can affect how an item is produced or sold (Sullivan & Haltinner, 2016). When it becomes cheaper to produce overseas, to import products, and to abandon domestic manufacturing, the incentive for local production is diminished. The demise of textile manufacturing in the U.S. has been an example where trade has harmed a specific industry (Lentz, 2010).

History and Image of Manufacturing

In 1995, Danziger and Gottschalk discussed how at one time in the U.S., manufacturing jobs were thought of as good, family supporting wage positions that were easily obtained through only a high school education (as cited in Albrecht & Albrecht, 2010). People could rely on them to be available upon completion of their secondary education. These decent wage, low skill jobs have been disappearing, however, as the economy has been restructuring.

Manufacturing in the past was heavily focused on quantity over quality. As long as quality was relatively even among competitors, the organization with the lowest cost could win out. Even higher cost products could reign superior if a competitor's quality could not keep up. Leading up to and shortly following World War II, the U.S. manufacturing environment focused on quantity. The need to get a product produced outweighed the desire to focus on quality. Then in 1951, leaders in Japan created the Deming Prize to increase the focus on quality. By 1970, products in Japan achieved higher quality than those in the U.S. This set the stage for increased competition (Evans & Lindsey, 2014).

In addition to Joseph Juran and Edward Deming's work related to quality, a need was seen for international quality standards. Quality was being defined differently among different countries. In 1946, the International Organization for Standardization (IOS) was created to address this. By 1987, 91 nations had agreed to adopt specific quality standards. The agreement, later known as the ISO 9000 Standards, now means that the quality of all adopting nations is perceived as equal to another (Evans & Lindsey, 2014).

Manufacturing jobs of the past took place at a time where trade was not as much of a concern. Before 1980, deregulation of trade barriers was not a focus (Ciccaglione & Strickner, 2014). As such, those within the U.S. consumed most of what was produced. The actual

consumer produced the parts made for the product and was responsible for its assembly. The lack of a global economy meant that competition was relatively small. This has since changed.

In 1994 after NAFTA was passed, it eliminated the majority of tariffs or taxes on goods traded between the U.S., Canada, and Mexico. This has resulted in lower priced products for consumers domestically because lower labor costs in other countries allows goods to be brought in at reduced prices compared to being manufactured in the states. The affect was amplified when tariffs on textiles were eliminated, which has allowed for clothing from China to be imported (Childress, 2012).

The result of global trade has meant that manufacturing has declined in certain sectors. Positions of the past, which were heavily reliant on manual labor and lower skills, have been affected the most. Production of paper products, textiles for clothing, and assembly of products were some of the losers in the new global market. To stay competitive, manufacturing firms within the U.S. must refocus on how to differentiate themselves in an industry that can easily be outsourced. With a focus on quality and cost now engrained, manufacturers are embracing technology and higher skill sets (Childress, 2012).

Safety and Technology in Manufacturing

Safety is and has been a concern when looking at the production of goods since the Occupational Safety and Health Act was passed in 1970. Its aim was to ensure everyone safe and healthy working conditions (Silverstein, 2008). Although improvements in safety have been made, Silverstein stressed that there is still much to do. In some cases, people still view manufacturers as being bad and in need of tight control (Gold, 2012). Within manufacturing, a focus on new technology and automation has been a driving force in the reduction of workplace injuries. Manual, repetitive activities have been slowly replaced by technology. This new

technology is resulting in a new manufacturing environment that is now science, technology, engineering, and math (STEM) focused rather than the traditional industrial manufacturing where technology was not as much of a focus. Today's advanced manufacturing is steeped in high technology. As a result, more education is needed in the future despite an apparent lack of interest (Hessman, 2015).

Modern Perceptions

Although many manufacturing facilities are now clean enough to eat within, and some companies are actually doing this to change perceptions, many Americans are still not convinced that manufacturing industries are safe, clean environments for workers (Bates, 2007). It appears that when thinking about manufacturing, many people still think back to the conditions of the early 1930s and 1940s where it was dangerous, dirty, dead-end, unskilled, and a lot less exciting (ReWeick, 2014). Additionally, many Americans still view manufacturing as a declining industry overall despite 80% of employers surveyed who cannot find enough qualified candidates (Lewis, 2003). The image of dark, dreary, and dead-end is hard to shake (Dillon, 2011).

There is very little support among parents to encourage their kids to pursue a career in the manufacturing sector. The trend is even more troubling considering the potential future female workforce. Currently, research supports that females perform as good if not better at the subjects associated with STEM (Smith, 2011). Despite this, their participation is still below that of males. Manufacturing continues to be male dominated. While women make up 46% of the workforce in the U.S., under 25% work within the manufacturing sector (Bond, 2013). Although Bond reported that the women working within the industry enjoy it, they are more likely to

recommend it to their male children compared to their female children. Fathers are even more unlikely to recommend it to any of their children.

According to polling done by Modern Machine Shop in 2012, 70% of parents would not recommend a manufacturing career to their children. This is problematic given that roughly 2.5 million Baby Boomers are set to retire in the next decade (Kennametal CEO Addresses Misconceptions about Manufacturing, 2014). The poll also identified that although 65% of those surveyed think manufacturing jobs are valuable, only 9% think manufacturing has a bright outlook for our economy (Poll Shows Manufacturing Misconceptions, 2012).

Manufacturing in the U.S. continues to be the most productive in the world thanks to the adoption of new technology and an increased focus on higher skills (Brown, 2012). Despite the perception that wages are relatively low, many wages in the new advanced manufacturing careers pay wages higher than in other sectors. A recent U.S. Commerce Department (2015) report showed that manufacturing wages are between 2-9% higher on average than wages in other industries. Unfortunately, low interest in these jobs and associated training programs may be creating a skills gap across the country that could result a long-term supply shortage (Overman, 2013).

Advanced Manufacturing

Consistency of terminology can be challenging at times. When words are used to convey a message or a thought and there is no true agreement on the definition, confusion may arise. There are differing views as to what this entails. Some people view advanced manufacturing as only products produced with the latest technology, while others believe the characteristics of the product itself or the complexity of it determines whether or not it falls under the heading of advanced manufacturing. This divide can leave entire industries unrepresented within the

discussion. Robotic manufacturing of automobiles would appear to fall into the definition under one scenario while computer controlled software, essential to the design of mechanical devices would qualify using the second scenario (Panghak, 2012).

To bring clarity to the exact definition of advanced manufacturing, the definition adopted for this study comes from the President's Council of Advisors on Science and Technology. In 2012, the Council published a report defining advanced manufacturing as a grouping of activities which require coordination between information technology (IT) and process activities while utilizing emerging materials and capabilities to produce new and existing products (President's Council of Advisors on Science and Technology, 2012). This broad definition helps solidify the transition of viewing traditional production manufacturing as low skill and low technology to one that according to Martino (2011), requires more math and stronger computer skills. The incorporation of robotics within welding, computer numeric control within machining and milling processes, and programmable logic controls within control panels, demonstrates how the production and maintenance pathways within manufacturing are rooted in advanced manufacturing principles.

Manufacturing in Wisconsin

Manufacturing in Wisconsin is an integral part of the economy. Wisconsin has over 10,000 manufacturing companies employing over 570,000 individuals. Overall, manufacturing jobs within Wisconsin have grown by 3.3% from 2011-2014 (Manufacturers' News, 2015). Per capita, this makes Wisconsin the top state in the U.S. for manufacturing jobs. With the gross domestic product being supported 20% through manufacturing, addressing the skills gap appears critical (Sullivan, 2012).

While some manufacturing jobs have been replaced due to imports of cheaper goods, it is primarily the lower skill jobs that are predominantly affected (Kemeny et al., 2015). Continuing to adopt the higher skill, advanced manufacturing jobs appears to be a safeguard against future job losses. There is still a high demand in Wisconsin for welders and CNC operators, which are high skill positions (Garrett, 2012). Additionally, industrial maintenance and CNC or machining jobs are expected to grow by 29% (State of Wisconsin WORKNet, 2016).

Generations in the Workforce

The workforce of today is dynamic in generational representation. The recent downturn in the economy coupled with the increase in retirement age has resulted in up to four different generations working side by side within industry (Bencsik, Horváth-Csikós, & Juhász, 2016). Each of these groups grew up in different economic and societal times, and each has their own unique views and values. While the categorization of an individual to a specific generation is not completely clean and without debate, generational names have been given based upon their current age or range of birth year (Cogin, 2012).

The oldest category of workers are often referred to as traditionalists, born before 1946; then the baby boomers, born between 1946-1960, generation X employees born between 1960-1980; generation Y (“millennials”), born between 1980-1995; generation Z, born between 1995-2010, and alpha represents anyone past 2010 (Bencsik, Horváth-Csikós, & Juhász, 2016). For workforce purposes, we would typically only see the baby boomers, generation x, and the millennials, although the earliest of generation Z are now making their way into the workforce.

Generational Expectations

The millennials are currently the most represented population within the workforce. They are considered to be native to technology and have a high sense of worth. This leads to a

high self-belief that may result in rejecting firm structure, pushing against perceived inequity, and pushing for flexibility in their work environment. They may also change jobs frequently as they search for entertaining work (Pînzaru et al., 2016).

Generation X is closer aligned to the millennials than the baby boomers; however, differences do exist. Unlike earlier generations, generation X and millennials tend to change jobs frequently. Research from decades past have shown that while workers tended to change jobs seven times over a period of 10 years (Topel & Ward, 1992), the number of jobs which the younger generations will hold is expected to increase dramatically. In a recent survey of millennial workers, it was found that 86% of respondents would not let a potential negative affect from job-hopping stop them from pursuing a better job (Maechler, 2016).

Cogin (2012) concluded that there are significant differences in generational expectations. The most striking is the value of hard work as measured by the protestant work ethic (PWE) scale (Furnham & Koritsas, 1990). Furnham and Koritsas reported that people with a high PWE tend to stay the course and work hard regardless if the work act is mundane. They are motivated internally and have a high internal locus of control. Cogin's (2012) results showed the value of hard work diminishing with each subsequent generation is problematic. The youngest generations are less likely to stay in an occupation that they find repetitive, mundane, or non-rewarding. Specifically, millennials are motivated to stay based on the ability to be recognized, receive frequent feedback, and based on the ability to fulfill social expectations while working on the job (Pînzaru et al., 2016).

Theory Base

This study draws upon a combination of career development theories to explore the underlying reasons students select to enroll in a specific manufacturing based one-year post-

secondary occupational program. The underlying theory base begins with Super's work values concept (Super 1962; 1975), where it is theorized that all employees enter the world of work with a set of expectations regarding what they will get out of a job. The study further recognizes that student's own experiences form their beliefs in their abilities, which in turn affects their goals, and expected outcomes (Lent & Brown, 1996; Lent & Hackett 1999). Social Cognitive Career Theory (SCCT) suggests then that exploring the beliefs held by these students in regards to manufacturing occupations, could shed light upon why they enrolled despite a potential negative image associated with manufacturing based occupations.

Additionally, identifying the specific population and samples for this study, this researcher draws upon the career cluster and career pathways work of the work keys assessment. Through this assessment, occupational areas are examined to identify the correlating skill requirements. Within manufacturing, both maintenance and repair, along with general manufacturing jobs, show the lowest education requirement of group level of 4 (LeFebvre, 2015). In contrast to higher requirements in other STEM fields, this isolates the one-year diploma programs as being the entry-level pathway into a manufacturing career.

Summary

Studies show there is and will continue to be a labor shortage in the U.S. (Brown, 2015; Cappelli, 2015; McMenamin, 2015). With an aging population, more workers are continuing to leave the workforce at the same time while states like Wisconsin are having a hard time recruiting more employees to enter the state (Sullivan, 2012). The required level of education for these open positions will dictate that workers receive post-secondary credentials to function effectively within these positions. Even within manufacturing, the needed skill-set has progressed from where it previously was making it important that youth or adults interested in

engaging within a manufacturing-based occupation engage is post-secondary training (Vavra, 2012). While enrollments in post-secondary CTE programs spiked during the last recession, the most recent data suggests that enrollments may be declining (Juszkiewicz, 2015). The focus of the Wisconsin Technical College System has been to prepare individuals to enter the workforce and therefore examining how students select to enroll in various occupational programs should be of interest.

Options for occupations vary widely across the U.S. To align needed skills with specific occupational areas, career clusters have been established. These clusters provide a conceptual framework for organizing careers and occupational areas into similar categories (Blosveren, 2015). The manufacturing career cluster contains specific pathways within it. The six associated subcategories include maintenance, logistics, health and safety, quality assurance, manufacturing production process development, and production (Wisconsin Career Pathways, n.d.a). The latter category of production is where much of the recent conversation regarding skill shortages has emerged. It also represents advanced manufacturing jobs such as welding and CNC. These areas show stronger than average job growth, good wages, and a common overlap in associated work values according to O*Net (2016).

There has been a stigma associated with manufacturing of the past, which still may exist today (ReWeick, 2014). These perceptions held by individuals may affect their desire to pursue a career within manufacturing even though the associated wages appear to be good when compared to other industries (Jusko, 2015). With the increased competition brought about from foreign competition and the passage of trade agreements among nations, U.S. manufacturing has taken steps to ensure its continued competitiveness (Childress, 2012). Facilities are employing more technology than in the past and have worked to make their work environments cleaner,

safer, and more attractive to future employees. The emergence of advanced manufacturing should be helping to offset previously held beliefs regarding manufacturing as being dark, dirty, or dangerous however there is currently no confirmation that this is happening.

A review of various career development theories shows how people make their decisions about careers. Super (1962; 1975) reported that individuals enter into an occupation having a predetermined set of expectations of the job. These work values are internally held beliefs about what is important within a job and are derived from earlier experiences and life stages. Super's work is complimentary to that of the Minnesota Theory of Work Adjustment (Dawis et al., 1964; Dawis & Lofquist, 1981), which theorizes that we do grow in our experiences and as we do, our desires or needs change. Like work values, these needs are desired to be met through our work environment. This is supported by Holland and Gottfredson's typology theory in that when the needs are met, there is congruence between our career and our desires (Holland & Gottfredson, 1975). When the job no longer correlates to these underlying desires, incongruence develops and dissatisfaction occurs. Additionally, SCCT describes how our ability or willingness to pursue an occupation is a result of how our past experiences have shaped our beliefs about the goals and expectations we have regarding work (Bandura, 1997; Lent et al., 1999).

When viewed independently, these theories have been proven to be valid. Collectively, they share commonalities. Within each of the mentioned theories lies the idea that as individuals, we have experiences that from who we are and what we value. We then enter into an occupation where we believe we can have these needs met. The end result of each then is the overall satisfaction or fulfillment of the needs or lack there-of.

Having established that individuals have specific goals in mind when they enter a career, it is important to highlight that men and women are known to have different goals or values

(Tak, 2004; Tien, 2011). It is also germane that within specific occupational areas, some common work values have emerged from previous research and evidence that generational expectations differ (Chak-Keung, & Jing, 2009; Cugin, 2012). Thus, an examination of students currently enrolled within a manufacturing based occupational program should reveal specific desired work values and reasons for enrolling, despite the potential negative perception associated with manufacturing careers.

Chapter III: Method and Procedures

The primary purpose of this study was to identify why students selected their specific post-secondary, short-term credential, manufacturing based career program, their perceptions of manufacturing, and what they value in work. By understanding influences, both positive and negative, it is hoped that it helps to inform future marketing efforts and help administrators in decision making related to raising enrollments in those programs. By understanding the factors which affect student enrollment, and identifying what the future workforce values in a job, it could also help local manufacturing companies promote their open positions by reviewing how they structure the work and career opportunities within their place of employment.

This study set out to answer the following questions.

1. What perceptions of manufacturing exist among those currently enrolled in a one-year manufacturing-based career program at Western Technical College?
2. What do students currently enrolled in a one-year manufacturing-based career program at Western value in a job?
3. Why did students who are currently enrolled in a one-year manufacturing-based career program at Western select that program?

Research Methodology

To understand the occurrence of a phenomena, there is a need to go beyond just the quantitative data. Qualitative studies recognize that through the constructivist lens, a person's own experiences form the meaning behind events and therefore discussions with individuals combined with an analysis of their own words can produce results which quantitative methods cannot (Creswell, 2009). To answer the questions posed in this study, a qualitative methodology was selected. Qualitative research is an appropriate methodology to use when the researcher

desires to search for meaning and understanding behind experiences or phenomena (Merriam, 2014). For the purposes of this study, the lived experiences and beliefs of students was the basis for understanding the meaning behind why they selected a manufacturing based occupational program. SCCT has shown that all of one's past experiences combine to create a level of self-efficacy which could help explain their motives for enrolling (Lent & Brown, 1999; Lent & Hackett, 1999).

Several past studies have focused on identifying the work values of students enrolled in a specific post-secondary program. These quantitative studies used an existing work values inventory to gauge what students value in a job, but any inclusion of a qualitative analysis was missing, leaving out potential values. These studies also did not address this particular audience, nor did they focus on what students thought about the occupational area they were entering. The literature review conducted for this study found that within manufacturing careers, there still may be existing stigmas, even from those who may be actively engaged within that career occupation. Shemwell (2010) suggested that qualitative interviews be conducted with students who are interested in manufacturing in hopes of revealing a cause of the interest, perceptions held, and potential recruitment techniques.

Subject Selection and Description

The primary population studied was students currently enrolled in their final term of a one-year, post-secondary manufacturing program of study at Western Technical College. Specifically, purposeful sampling was done to select students enrolled in welding, machining, and industrial electronics maintenance. The purposeful selection of pre-existing groups was made to encourage participation while still comparing groups (Barbour, 2005; Gill, Stewart, Treasure, & Chadwick, 2008; Redmond & Curtis, 2009). Convenience sampling was then used

to obtain the participants. Participants were provided informed consent forms (see Appendix K) and were allowed to opt out if desired. Due to the small population size of the three study areas, adding additional criteria to the selection process would have resulted in too small of numbers to conduct the focus groups.

The focus group method was selected for this study based upon the ability to arrive at the knowledge and experiences of the participants who share the common interest of selecting a manufacturing based occupation (Bloch, 1992). The author also found that focus groups are appropriate for assessing career programs and services. Each focus group consisted of students enrolled in one specific occupational program and represented approximately 60-90% of the total population of the individual program and 72% of the total population enrolled in a one year program of study.

The decision to have direct conversations with students currently enrolled in manufacturing programs followed the suggestion of Karl (2012). The author focused on factors affecting enrollment decisions by selecting students currently enrolled in a manufacturing-based occupational program of study. The specific occupational programs were selected based on the work keys framework that identified these programs as having similar skill requirements and thus representing the entry pathway into a manufacturing occupation (LeFebvre, 2015).

Instrumentation

In a qualitative study, the primary instruments used are observation and conversation with the researcher acting as the instrument (Creswell, 2009). The primary source of data collection from this study involved the use of focus groups. Following Creswell's advice (2009), focus groups were guided using the same structured process and interview questions to ensure internal reliability (see Appendix A). Since multiple focus groups were given, consistency of the

process between groups was essential. A semi-structured interview process was used to ensure that the most data could be collected in the most efficient use of time (Doody & Noonan, 2013) while still allowing for some deviation which could occur based on the discussion of the focus group. The open-ended interview questions for each group were mapped to the corresponding research questions in advance to ensure alignment in order to be able to help answer the research questions (Gill et al., 2008).

Before using the instrument in this study, a pilot study was conducted with students enrolled in a two-year manufacturing program to establish the validity and effectiveness of the guiding questions. Questions were tested for ease of understanding, as well as for the ability of the participant to answer based upon their knowledge. Before the process began, participant introductions were given and then age, work history, and whether or not a family member has ever worked in manufacturing was collected. During the study, audio recordings were made of the focus groups and later transcribed for analysis.

The focus group technique was found to be useful when identifying paradigms and perceptions associated with another career choice—nursing (Brodie et al., 2004; Jansen & Vetter, 2015). Applying this technique to a different occupational area was an extension of that work. Selecting students currently enrolled in a manufacturing-based occupational program ensured that they have an interest in manufacturing and are familiar with the topics of discussion (Plumer-D'Amato, 2008).

Data Collection Procedures

This study utilized a structured focus group process and nominal group technique to gather the data. Before data collection, approval was sought and received from the institutional research department at Western and the UW-Stout Institutional Research Board. An e-mail was

then sent to instructors at Western that are involved with the one-year CNC, welding, and industrial maintenance programs asking for permission to speak to their classes about participating in the study (see Appendix C). A follow-up email, containing the same message was sent to those who had not yet responded after a one week time period in an attempt to gain access to participants.

Next, a face-to-face meeting took place with potential student participants within their classroom. The classroom environment was selected for the meeting to provide uninterrupted privacy while also serving to satisfy the need to conduct the process within the natural environment of potential participants (Creswell, 2009). Students were provided with the background of the study and asked for participation through a script which can be found in Appendix D. Once interest was confirmed, a follow-up e-mail was sent outlining the details of the participation (see Appendix E).

Participants took part in one of four focus groups that were comprised of existing students within a specific career pathway. One focus group each was held for participants in the CNC and industrial electronics maintenance programs respectively while two focus groups were held for participants within the welding program. This corresponded with the total sections of participants within each career pathway area. The decision to utilize single profession groups as opposed to mixed-profession groups stemmed from the focus of the research in identifying why participants selected their own specific program area as opposed to another similar program.

Each focus group was limited to no more than 10 participants, was assigned a group number, and took place in a classroom where privacy could be maintained. The target number of participants per focus group was selected based upon Creswell's (2009) recommendation of six to eight participants, but also inviting a couple more just to be sure enough attended and

recognizing that any less than three would be challenging during analysis. Before the group discussion, participants introduced themselves, provided their age, whether or not a family member works in the manufacturing sector, and whether or not they have previously worked in the industry sector. This demographic information was recorded for later analysis and comparison to answers given.

During the interview questions for research questions 1-3, the nominal group technique (NGT) was used as participants were led through a four-step process (McMillan, King, & Tully, 2016). They were each given 3 x 3 sticky notes at the beginning of the process. This researcher then asked the group a question and instructed them to record their responses silently on each sticky note. During this time, this researcher stayed quiet and not engaging or recording personal ideas. After five minutes of individual recording, this researcher collected the responses physically and verbally in a round robin format and posted them to the wall. The participants were then led in discussion of the findings to garner an understanding of meaning and clarification of thoughts. Similar thoughts were organized together and a group attempt at identifying themes took place before participating in a vote to identify the most important values they held towards work. Data collection for questions 1 and 2 followed the same process; however, no attempt at group voting took place due to the lack of desire for a hierarchy of perceptions and influences.

For research question 2, participants were then given a voting sheet that they completed independently (see Appendix G) in addition to a complete list of work values to help them in the ranking process (see Appendix H). The work values provided for ranking consisted of the 12 work values as defined by Super's revised WVI (as cited in Robinson & Betz, 2007). Each participant used these two documents to vote for their top five work values. Participants placed

the number 5 next to their top work value, the number 4 next to their second work value, and so on for the next three work value priorities. Additionally, during this process, audio recordings took place and photographs of the sticky note thoughts and organization were gathered. An example of the groups' attempts at categorizing data can be viewed through the photos of their work found in Appendix F. By collecting information in a written format in addition to the audio recording this researcher created a safeguard against any potential technical glitches.

Validity and Reliability

Creswell and Miller described qualitative validity as “determining whether or not the findings are accurate from the standpoint of the researcher, the participant, or the readers of an account” (as cited in Creswell, 2009, p. 201). To establish validity, this study incorporated several strategies. To establish content validity and validate that the instrument and process measure what is intended, triangulation of the data to the literature review serves as the baseline for content validity (Creswell, 2009). Creswell argued that if themes are built and justified based upon the data, how it relates to research, and the source, additional validity is created. This researcher followed this process.

The nominal group technique process was incorporated into the focus groups as a way of member checking data and building validity. This researcher also included within the study any emerging themes that ran contrary to the themes from the literature review. Additionally, personal reflexivity and peer-debriefing helped ensure that personal bias in the findings and representation of information were not present (Creswell, 2009).

The goal of qualitative studies is to not generalize the results of findings as much as it is to explain something within a specified parameter (Creswell, 2009). However, the current research study may serve as a way to generalize future findings by using the results of this study

and then comparing to additional future studies (Yin, 2009). Recognizing a need still to build additional reliability into the process, a pilot study was conducted with six manufacturing students not part of the sample but utilizing the research questions. The pilot revealed that the specific language of the questions did result in answers given that provide the required data for analysis. Specifically, the pilot revealed that if the words to question one were changed to include “describe,” participants were unable to describe a manufacturing environment because of a lack of experience within it. Lastly, by triangulating the findings of each focus group to one another, the process also brought additional validity and reliability to the study.

Data Analysis

Data gathered included an audio transcript of each focus group with recorded thoughts using the Revit audio recording software, sticky notes as visual evidence, and photographs of the organization and emergent themes (see Appendix F). During the focus groups, data was collected and presented in the form of ideas that were generated during the silent generation process and the round robin process. A round robin involves equally choosing all elements in a group in some rational order, usually from the top to the bottom of a list, and then starting again at the top of the list (Rouse, 2010).

Participants then organized their thoughts into categories by identifying where individual thoughts were similar to the thoughts of others. Ideas that were identified as the same were recorded as one collective idea, and then the totality of remaining ideas were discussed for meaning and classification. This could include using the same term or also different terms that had the same underlying meaning. Once the thoughts were organized into like categories, participants then arrived at a theme which best described their thoughts.

Known as open coding (Creswell, 2009), it is the first step in the data analysis process during a focus group. The coding by participants added validity by essentially acting as the second, third, or fourth researcher independently coding and comparing (McMillan, et. al. 2014). At the conclusion of the focus groups, this researcher had four sets of data, all of which contained preliminary themes as identified and confirmed by participants.

After the focus groups were completed, this researcher used a thematic analysis process from Miller et al. (2014) to work through the three research questions. The first step in the Miller et al. process was the actual collection of data through the focus groups. The audio files from each were hand transcribed to develop a written record of the data that was the second part of the first step.

Step two involved taking the text and inserting it into the first column of a spreadsheet exactly as it appeared in the transcript. Per the Miller et al. (2014) model, the words were then reviewed to eliminate common filler words that did not add to the underlying meaning of the answer but only served as a part of the sentence structure. Consistent with the model, filler words were left within the transcription but were crossed out leaving only a summary of applicable thoughts in column one of the spreadsheet.

Step three of Miller et al. (2014) process involved comparing words and the underlying meanings that were repeated several times across respondents within each individual group. These commonalities informed the development of the thematic schema or patterns as noted by Miller et al. The text from column one was, which was representative of the thoughts and ideas, was then moved to column two and included an identified theme which categorized the collective thoughts. Staying consistent with the Miller et al. model again, the text was reduced further by striking out the words which were not part of a larger theme.

Step four of the thematic analysis looked at the remaining text and thematic schema from individual groups and compared it to responses and themes across all groups. All thematic schemes across groups were reviewed and the text brought over into column three of the spreadsheet to arrive at the advanced schema, which was more representative of themes which were more prevalent in one specific group or across groups. By comparing cross-group responses, it made it possible to then understand the specific experiences of groups and how, if at all, they differ from the others (Miller et al., 2014).

The last step of the Miller et al. (2014) process was to take these findings and arrive at a synthesis of all responses and themes which spoke to how the thematic and advanced schema presented itself through the research findings. The fourth column of the spreadsheet now contained only the synthesized ideas from this researcher which is consistent with the Miller et al. process.

The final analysis contained a synthesized list of values participants hold about a job, perceptions they hold about manufacturing, and influences that helped them make their program choice. Descriptive statistics were later used to summarize the findings, and a structural explanation of findings was presented in a narrative summary of findings. A sample of analysis, which began with detailed summaries, followed by comparing across respondents to arrive at thematic schemas, comparing across respondents to form advanced schemas, and concluded with a synthesis of ideas can be found in Appendix L.

Unique to research question two, an additional analysis step was taken. During the data collection process for this question, participants ranked their top five work values by order of importance. The results of this ranking were then added into an Excel spreadsheet to calculate importance of the work values across groups (McMillan et al., 2014).

Importance was calculated in three different ways: the total sum of points for a specific work value, the relative importance of a work value, and the frequency of votes for a work value. To arrive at the sum of points, the total points (a specific work value) received were calculated. The work value with the highest total sum was ranked as number one and so on. “To establish the relative importance of the work values, the formula of $(\text{sum earned})/(\text{maximum possible score}) \times 100$ was used” (McMillan, et al.,2014, p. 98).

Last, to break any tie in ranking that may have resulted from the same total sum of score and relative importance score, this researcher calculated the frequency of voting for each specific work value. Frequency of voting was calculated by adding up the total number of times a specific work value was given a ranking by participants. The full results of this analysis can be found in Appendix M.

The results of the theme analysis were then compared to existing themes identified through the work values inventory (Super, 1962, 1975). The final analysis contained a synthesized list of values participants hold about a job, perceptions they hold about manufacturing, and influences that helped them make their program choice.

Limitations

Ideally, focus groups should be comprised of a homogenous group of individuals who do not know one another. This counteracts the potential for dishonesty among participants as they may not openly share everything with those whom they know (Redmond & Curtis, 2009). Due to the study examining students within one institution, and the desire to keep the findings identifiable by career pathway program, it was necessary to utilize students who may have had relationships with one another through the purposeful selection process. Utilizing participants

who knew each other allowed for a homogenous sample, which was necessary to ensure that all knew the subject and had an interest in it (Plumer-D'Amato, 2008).

The manufacturing career field is predominantly male, which leaves female representation lacking. Additionally, the student population is skewed toward a younger age bracket, which leaves the representation of older age demographics limited. Given the skew to the left of this age demographic, only aggregated findings were presented to maintain the anonymity of those falling in an older age demographic. As a result, no analysis can be done to compare responses from one age bracket to another.

This study took place where this researcher held positional power and had continued access to the participants for a brief period following this study. To ensure the data was not compromised, this researcher had no formal authority over participants' grades. Participants were surveyed in their final term of their program. By the time the study was completed, participants had already graduated and left their program.

During the voting process in question two, participants were provided a copy of the 12 work values and asked to rank their top five by order of importance. Although the research did not identify this information as influencing student responses to question three, the possibility cannot be ruled out.

Summary

This study utilized structured focus groups with students currently enrolled in a one year, post-secondary manufacturing based occupational program at a two-year Midwestern technical college. Participants were provided informed consent forms (see Appendix K) and were allowed to opt out if desired. The study's three main questions were used to create an interview schedule for each focus group. The focus group sessions were recorded using an i-phone and the Rev

software app with the recordings later hand transcribed with verification of accuracy being done through an additional manual review by this researcher. Participants also took part in the initial coding of data through the focus group process with this researcher then using the Miller et al. (2014) five-step thematic analysis process to arrive at enduring themes.

Chapter IV: Presentation of the Findings

The primary purpose of this study was to identify why students select their specific post-secondary, short-term credential, manufacturing based career program, their perceptions of manufacturing, and what they value in work. By understanding influences, both positive and negative, it is hoped that it helps to inform future marketing efforts and help administrators in decision-making related to raising enrollments in those programs. By understanding the factors which affect student enrollment, and identifying what the future workforce values in a job, it could also help local manufacturing companies promote their open positions by reviewing how they structure work and career opportunities within their place of employment.

This study attempted to answer the following questions.

- What perceptions of manufacturing exist among those currently enrolled in a one-year manufacturing-based career program at Western Technical College?
- What do students currently enrolled in a one-year manufacturing-based career program at Western value in a job?
- Why did students who are currently enrolled in a one-year manufacturing-based career program at Western select that program?

A qualitative research study was conducted, which utilized focus groups consisting of students currently enrolled in the short-term manufacturing programs of welding, CNC, and industrial electronics maintenance. The focus groups were facilitated by the researcher and guided by a series of three research questions presented through the interview protocol (see Appendix A). Data collected through this process was then analyzed to produce thematic and advanced schema.

Demographics

Participants in this study were limited to those currently enrolled in a one-year manufacturing based occupational program of study. Participants were limited to one mid-western college within the Wisconsin Technical College System to allow for the exploration of similarities and differences between the different populations that could explain why one program was being selected over another within that institution. To be selected for this study, participants needed to be actively enrolled in the second term of their one-year program.

Students were asked within their classroom to participate in the study through a face-to-face personal invitation from this researcher and followed-up by a personal e-mail. Thirty-nine subjects were invited and 28 chose to participate for a participation rate of 72%. Each panel consisted of between four and ten participants. The average age of participants was 25.29 years with a mode of 19 and range of 45. The frequency of participants between 18 and 20 years of age was 67.86%. This frequency demonstrated that the majority of participants were under 21 years of age. Sixty-four percent of participants indicated having a family member who worked within the manufacturing sector while 39% reported having worked within manufacturing themselves.

Findings

Four focus groups were conducted in this study. The same interview protocol was utilized with each group during the 75-minute process. In addition to the interview protocol, clarifying questions were sometimes required for this researcher to draw out additional meaning of comments made within the individual focus groups. As a result of the focus groups, the following findings are presented and organize by research question.

Research question 1: What perceptions of manufacturing exist among those currently enrolled in a one-year manufacturing-based career program at Western Technical College? To answer this question, the corresponding interview question was: When you think of working a manufacturing job within a manufacturing setting, what specific thoughts come to mind? This was followed up with the question: Do you think differently of manufacturing and advanced manufacturing?

An analysis of the responses provided for interview question 1 revealed five themes common to all three program areas and one theme unique to only the CNC program area. The themes for research question 1 represent the students' own opinions or paradigms of what manufacturing is and are presented in no particular order of importance. To qualify as a theme across all programs, it had to be an area of discussion within all three programs and could not be unique in meaning to only one participant.

While it may be that students used the exact same words to form a theme, it was often the meaning behind the words that when combined formed a theme. The lasting themes are also themes that were not contradicted by participants through the discussions. To qualify as a theme within one program only, it had to be an area of discussion within that program that was agreed to by more than one participant and was not contradicted by others within that program. While the themes were primarily negative, a couple positive themes also emerged. A summary of all five themes common to all programs is shown in Figure 1.

1. The work environment, type of work, and associated skill requirements are viewed primarily in a negative light; however, manufacturing jobs can provide good pay and benefits and be good if you enjoy it.
2. Students have negative views of employee-management relations.
3. Students feel pressured to view manufacturing in a negative light.
4. Students view smaller businesses more favorably than larger businesses.
5. Students do not perceive the term manufacturing as representing their program areas while to students did think advanced manufacturing portrays a better image and is better aligned with students' programs.

Figure 1. Perceptions of manufacturing common to participants.

Theme 1: Negative views of the work environment, type of work, and associated skill requirements, but a potential for good pay and benefits. The first theme identified was a negative view of the manufacturing environment, the type of work involved within manufacturing, and the associated skill sets required to do that work. When the majority of participants first thought of manufacturing, their thoughts reflected manufacturing that takes place inside a large factory on an assembly line with people doing the same things over and over every day. A few participants shared that it is “not really much room for learning.” In their discussions, participants later refined the term *assembly line* to mean “repetitive work” or work that one participant described as “a trained monkey can do.” The hours of work were described as “long, 10-12 hours a day, or 8 hours, which feels like 16 hours because it feels like it drags on.” Several said, “If you’re doing the same thing, it’s going to feel like the hours are double.”

Participants generally perceive manufacturing work as hands-on, blue-collar work, which not many people want to do. The work itself is also described as “hard work that nobody else

wants to do.” One participant said, “It entails having to listen to the machines run all the time ... making loud noises.” The role of the worker was mostly described as being mostly physical except for when “you’re just the guy running the machine to make sure it doesn’t break.” The process itself is less people-focused than it is, as several students described it “mass productions by machines.”

The work environment itself was commonly reported as being dirty or un-kept. The feeling of dirtiness and disorganization was evident by comments such as “they’re all big factories that are dirty: you’re going to get dirty. You’re always having to pick stuff up ... moving stuff around, while being in a building which is low lit, greasy, and like an old school factory.” When one participant said, “Safety is a concern due to all of the moving equipment,” the majority within group shook their heads in agreement.

The compensation for working in these manufacturing environments was described by one participant as “being lower (sic) pay or cheaper labor for those with lower education or less than a four-year degree.” Participants often mentioned the theme of lower pay. However, contrary to this, some participants also expressed that manufacturing provides good wages and benefits, especially for the “skill you have.” It was recognized that there are “higher than just production jobs like supervisor positions and higher paid maintenance positions.” While some manufacturing jobs are entry level, as one participant described it “if you go in with an education and you find a job that isn’t dirty, you can actually get better pay, get a little bit higher on the totem pole ... it could actually be a great career for you,” said another participant. Overall, participants expressed a common belief that there are good job opportunities and an opportunity to earn a steady paycheck.

Theme 2: Negative views of employee-management relations. The second theme identified was a negative view of employee/management relations. Participants' perceptions of relationships between employees and management within manufacturing were expressed in negative ways. In one instance, a participant whose father works within manufacturing stated, "People are just feeling hopeless, not appreciated." Participants discussed that employers are forcing overtime work and sometimes providing short notice of the required overtime, which further expresses the feeling of being unappreciated. Several participants alleged that employees in manufacturing are "just a number" and that "if they can find someone cheaper, they'll let you go." They used examples of recent layoffs as demonstrating this feeling. A few of the participants also cited a concerns regarding the practice of connecting wages to productivity. In particular, they contend that the work environment is less safe due to piece rate bonuses because "that promotes people to cut corners."

Theme 3: Pressure to view manufacturing negatively. The third theme related to how others around the participants influence their perception of manufacturing. When pressed why the perceptions of manufacturing were coming out in such a negative light even though they had selected this career path, it was revealed that participants feel pressure from those around them to view it negatively. In one example, a participant initially refused to offer his own perceptions because of how others in the room might perceive them. He said, "I deleted some of mine cause (sic) no one else's were like mine, I deleted them because they were stupid." As others were revealing their negative perceptions, this same participant acknowledged feeling pressured to not disagree even though his perceptions were of a higher technology and higher skill environment. Other participants attested to a recognition that others in society influence their own views. One said, "Other people out there influence you. You've chosen this career, but everybody tells you

that it's not a good job, that it's greasy, dirty, repetitive stuff." Watching the participants reaction to this statement revealed most agreed because of several nodding their heads in agreement.

Theme 4: Smaller businesses are viewed more favorably than larger businesses. The fourth identified theme was a clear preference of participants for smaller employers. In the various groups, participants discussed differences between large and small employers while describing them. Some described smaller employers as providing less repetitious jobs and providing opportunities to be as one participant said, "Constantly doing something different." Several participants explained the preference for doing something different stems from a desire for "room to learn" within a job. Since there are less people in smaller organizations, they proclaimed there is more flexibility with job requirements.

Participants went on to assert that employees in smaller businesses "naturally have more variety of responsibilities," said one participant. It is believed that with increased responsibility comes increased job stability. As one participant stated, "Knowledge is better than anything else. The more skills you have the more likely people are going to want to keep you or put you on more jobs." With a smaller employer, he continued, "The owner is right next to you working. They cannot afford to have you get hurt."

Participants articulated that a smaller employer would also value their employees more because they relied more on them. They expressed a sense of connectedness between the employer and employee. At one point in the study, participants bumped fists with other participants after he declared, "When you're on a massive scale, you become a number instead of a person; you do the same thing every day." Another student explained that he felt "if they can find someone cheaper, they will let you go."

Theme 5: Manufacturing does not represent their program, but advanced

manufacturing does. The fifth theme identified was the claim that manufacturing and advanced manufacturing were different, and manufacturing as a term does not reflect the programs these participants are enrolled in. Participants unanimously argued that the programs of welding, CNC, and industrial electronics maintenance should not be referred to as manufacturing careers. They described various ways how manufacturing work is characterized negatively, yet their program is not.

Participants described manufacturing as “the guy running the machine.” They implied that to run it requires no skill. In another case, a participant reported that specific work done for manufacturing is “insignificant, doesn’t require a degree, and the machine does all of the work.” This appeared to be a satisfactory explanation to the others in his group. The work these participants expect to be engaged in is at a higher level than this.

When the word *manufacturing* was used, many participants immediately reported thoughts of “sitting in one place, assembly lines, and mass production by machines.” In one case, a participant stated, “I wouldn’t have thought of it as manufacturing, otherwise I wouldn’t be doing it.” Using the term manufacturing to describe these manufacturing occupations actually deters interest.

Participants in each group discussed their perceptions of how the term *advanced manufacturing* is different than the term manufacturing. They stressed that advanced manufacturing is better aligned with what they think of as their career. Statements associated with advanced manufacturing included “it requires more skill and education,” “utilizes more technology,” and “is more precision work.” The term advanced manufacturing also conveys an

image of a cleaner work environment—one where one participant said, “You could eat off of the floor.”

Theme unique to CNC students: A positive view of unions. Research question one revealed five themes common to all program areas and one theme common only to the participants enrolled in the CNC program. The result is shown in Figure 2.

- | |
|---|
| <ul style="list-style-type: none"> • CNC students have a positive view of unions |
|---|

Figure 2. CNC students’ perceptions of manufacturing.

The only theme identified unique to one program area was an appreciation of unions by this group of participants. Manufacturing environments that have active unions are thought of more highly of than non-union environments. Participants in the CNC program concurred that “the pay is usually going to be livable in a union shop.” They asserted that a union not only protects the wages, but also the safety of those working there. Regulations enforced through OSHA are believed to be followed more when in a union environment. As one participant stated, “There is only so much they can do within the guidelines of OSHA that is protected more in a union shop,” implying that employers are forced to focus on safety when a union is present. He went on to describe how the only place he felt where he “wasn’t risking his life” was when he worked for a union environment. Another participant described how the group had gone to different manufacturing facilities and viewed how unions affect the work environment.

It should also be noted that while all programs reported good earning potential within manufacturing, the CNC group was the most vocal about this. Later on in research question 3, these same students talk positively about the local machining union.

Research question 2: What do students currently enrolled in a one-year manufacturing based career program at Western value in a job? One interview question

and a follow-up statement were used to address this research question. The question was: What are the top three things which are important to you in a job? Liking it would not be specific enough. During the discussions, participants across all programs reported that to a varying degree, the values of income, co-workers, life-style, supervisor, environment, job security, achievement, prestige, and mental challenge are all values they expect in a job. They were then asked to rank their top five work values by order of importance. Twenty-seven of the 28 participants turned in a ranking sheet, thus the results are based on 27 participants.

The results were analyzed in two ways. First, the total responses were aggregated to arrive at a ranked priority of work values from all four focus groups. Second, an analysis was done on the individual program rankings to identify if any differences exist among the different programs in the study.

Out of 12 potential work values contained within the revised version of Super's Work Value Inventory (WVI) (Robinson & Betz, 2007) and the 9 originally identified by the participants, five were identified as being the most important when combining the scores for all participants across all programs. The results of that ranking, by order of importance, are shown in Figure 3.

1. Income. Making enough money to live and support obligations
2. Job security. A desire for stable work free of the worry of layoffs
3. Supervision. Having a manager who values, trusts, and respects them
4. Workplace. A desire for a safe and clean work environment
5. Variety. Having opportunities for variety during the workday

Figure 3. Students' work values ranked across all programs.

Aggregated work value 1: Income. The first work value, by order of importance, was the value of income. Income ranked number 1 in terms of sum of votes (116 points), relative importance (28.6%), and frequency of voting (26 of 27 votes).

The comments encompassed direct wages, available overtime, health benefits, and retirement when the participants spoke of income. They commonly defined medium pay as being \$20.00 per hour, which they asserted is an acceptable starting wage, but pointed out in a couple of cases that "\$40,000-\$50,000 would be ideal for a younger worker, but for an older one, it should be more." Income was identified as the top value because as one participant said, "Money is life ... basically ... and no one wants to be poor, I want to provide for my family." In many cases, participants reported a willingness to work more for the wages they desire. In several cases, participants claimed a desire to "try to work as much as possible and bring in as much as you can." Another stated, "Available over-time would be nice if you wanted it ... it's nice to have the extra cash ... not being able to have time down to reenergize yourself, that's bad."

Overtime opportunities were viewed as both positive and negative. Overtime or working shifts that are not first-shift received the most unfavorable responses. Specifically, one participant said, "Third shift, or overnight, or anything like that ... that would suck." Another stated, "Second shift. When you have family and kids, you never see them." When overtime is required, it often results in working a shift which is different than their traditional shift because it crosses start and ending times of the standard shift.

The desire for income was coupled with a desire for advancement within an organization. A few participants commented in similar ways that they would like to work their way "up the

totem pole for pay” and “to be a little bit higher on the totem pole, have a little more responsibility, a little bit higher pay.” There was also an expressed desire for learning within the manufacturing environment because, “I wouldn’t want to be the person that’s at the bottom of the totem pole their entire life.”

The distance an employer is to the employee also affects the views of the participants regarding compensation. While the welding student has a clear desire to travel for work, all others within the manufacturing programs judged a salary in relation to how far they would need to travel in order to obtain it. Driving an hour one-way was reported as the cut-off for what is desirable. Participants reported asking themselves “how long of a drive is it for me, is it worth the drive for what I’m getting paid to go up there?” Longer commute times are associated as adding to unnecessary wear and tear on vehicles, creating higher fuel costs, and reducing the available time to be with their families.

Aggregated work value 2: Job security. Job security was a large concern for these participants and came in as second most important with a sum of votes (66 points), relative importance (16.3%), and frequency of voting (20 of 27 votes). Students in each group reported knowing people that lost their jobs due to manufacturing moving overseas. Some also reported losing jobs themselves because of a layoff, which was what brought them into the college. One participant said, “If you don’t have job security, all that other stuff is pointless.” Others proclaimed looking for a place where they could “stay 10, 20, 30 years long term instead of being worried about being laid off.” Unlike construction, where some participants believe layoffs are common and part of the work environment, most manufacturing students “don’t want to be laid off” and “would rather work year round than be off sometimes.” All students agreed

that job security means being able to buy a house, take care of their families, and support their hobbies.

Aggregated work value 3: Supervision. Supervisory relations were ranked as the third most important work value with a sum of votes (43 points), relative importance (10.6%), and frequency of voting (17 of 27 votes). During the discussions, a desire to work for someone who “knows who you are, knows you have family, and knows that work isn’t the most important thing,” was a common message. Most participants reported wanting supervisors who give constructive feedback, show appreciation, and provide help when needed or “a pat on the back” when deserved. Several participants claimed that when a supervisor acts like a co-worker, they are “on our level and helps a lot,” it enables them to respect the supervisor more because “they respect us.”

The participants reported seeing the supervisor as being the key to how well an employee likes his or her job. In one example, a participant said, “With one supervisor, the job is great, I love doing it, love coming to work. With a different one, I hate the job, I hate the supervisor, and I hate myself. It seems like a totally different job.” He continued, “When supervisors are acting like they’re better than you and bring down criticism, not constructive, it can turn a job really bad.” Another example of where supervisor relations were deemed to be important by participants was expressed desires of trust that they will meet their deadlines and to be given responsibility as a sign of trust by the employer.

Aggregated work values 4 and 5: Workplace and variety. The work values of workplace and variety received the same ranking by frequency of voting value (15); however, the sum total score for workplace (41) exceeded the sum total score for variety (39). Additionally, the relative importance for workplace was 10.1% compared to 9.6% for variety. Valuing the workplace

became evident through the discussions with the participants. Discussions included the value of the workplace providing a safe and good environment to work within. Examples of comments convey a desire for a clean and safe environment, not dark and gloomy where as one participant said, “Everyone’s depressed and ornery.” One participant discussed a work environment where “blade guards are on and personal protective equipment is provided.” In simple terms, “you don’t want to be scared for your life,” he said.

There were also expressed concerns about the kinds of tools provided and the equipment they are working with. During those discussions, participants mentioned looking to see if tools are in good shape, or beaten up, and abused. There appeared to be the perception that how an organization maintains their facility and equipment is a reflection of the manufacturing organization and how good of an environment it is to work in.

The following remarks from students reflect examples of their discussions related to valuing variety. One student said, “Repetition wears you out as an individual. I feel you would be happier at work if you didn’t do the same thing every day.” Another discussed how variety does not have to come in the form of doing different jobs, it can also come simply from working in “a different environment, going from one room to another, and working outside.” Many participants also expressed a desire to do “different things, not doing repetition.” According to one participant, “Doing repetitious work “takes a lot out of a person, I think it would be boring.”

The next step of the analysis looked at how each individual program ranked the work values as opposed to the aggregated rankings of all manufacturing students. The results of the work values ranked by the welding student participants are ranked order of the sum of votes and shown in Figure 4. The analysis of each of the three program areas (welding, CNC, and industrial electronics maintenance) can be found in Appendix N.

1. Income. Making enough money to live and support obligations
2. Job security. A desire for stable work free of the worry of layoffs
3. Workplace. A desire for a safe and clean work environment
4. Variety. Having opportunities for variety during the workday
5. Supervision. Having a manager who values, trusts, and respects them

Figure 4. Welding program specific work values ranking.

Program specific work values: Welding. When comparing the work values of welding students to the aggregated results from the overall career cluster, the top two identified work values of income and job security remained consistent. The value of workplace moved from the fourth spot to the third spot, while supervision moved from third to fifth and variety from fifth to fourth. Within these scores, the values rank did not change using the total sum of scores or the relative importance (48 and 36 points and 24.62% and 18.46% respectively). When looking at the frequency of voting as a measure, income and job security stayed as the top two while there were equal scores (8 votes) for workplace, variety, and supervision.

The results of the work values ranked by the CNC student participants are ranked order of the sum of votes and shown in Figure 5.

1. Income. Making enough money to live and support obligations
2. Job security. A desire for stable work free of the worry of layoffs
3. Workplace. A desire for a safe and clean work environment
4. Supervision. Having a manager who values, trusts, and respects them
5. Variety. Having opportunities for variety during the workday

Figure 5. CNC program specific work values ranking.

Program specific work values: CNC. Within the sample of CNC students, again the work values of income and job security stayed the same both in terms of total sum of scores and relative importance (25 and 13 points, and 33.33% and 17.33% respectively). Workplace moved up from the cluster score of fourth to be tied for second. Supervision moved to the fourth spot and variety to the fifth spot which was consistent with the aggregated cluster findings.

The results of the work values ranked by the industrial electronics maintenance student participants are ranked order of the sum of votes and shown in Figure 6.

1. Income. Making enough to live and support obligations
2. Lifestyle. Have time enough for leisure and family
3. Job security. A desire for stable work free of the worry of layoffs
4. Variety. Having opportunities for variety during the workday
5. Co-workers. Have good interactions with fellow co-workers
6. Supervision. Having a manager who values, trusts, and respects them

Figure 6. Industrial electronics maintenance program specific work values ranking.

Program specific work values: Industrial electronics maintenance. The final program area was the industrial electronics maintenance program. Like the other two programs, income stayed consistent as the top work value (total sum 43 points and 31.85% importance). For the first time though, the value of lifestyle made it into the top five list and was second in priority to the students (17 points and 12.59% importance). Job security fell to third place, with variety coming in at fourth most important. Workplace did not make the top five values for this population; instead, co-workers replaced that value and tied with supervision for the fifth most important values.

Reference to co-workers and lifestyle as important values were found within the data set as participants discussed having positive relations with co-workers and the concern for their (co-workers) lifestyle. One participant said, “Your co-workers can affect your attitude at work. You have to enjoy the people.” If you don’t enjoy the people that you’re working with, you’re not going to enjoy your job.” Another participant identified that the ability to learn from a mentor is important. Having access to a person skilled in your trade and being able to learn from that person who is willing to teach you are valued.

Along with co-workers, various participants referenced several items related to a concern for their lifestyle. To them, work is about making enough money to live a comfortable life, to have a good time, and to support your hobbies and family. “Taking time away from work makes for better production and atmosphere,” stated one participant. While acknowledging the value money and job security, to the participants, the job itself also has to align with where their life is currently at.

Participants older than the mean predominantly reported that good jobs a distance from their home were good. One said, “If you’re young enough to move away ... but not for us older guys who are set with their family.” These individuals also reported being busy and active in things outside of work. The more time spent working, the less time available for other commitments. Working becomes a necessity but according to one participant, “It isn’t the most important thing in your life.”

Research question 3: Why did students who are currently enrolled in a one-year, manufacturing-based career program at Western select that program? The corresponding interview question was: Who and what influenced you to select this specific career program? The follow-up question to this was: Why did you select this specific program over another

manufacturing based occupational program? Responses to research question three revealed three themes common to all programs regarding who influenced them to select their specific program and one theme exclusive to only the CNC students. The themes for research question 3 represent discussions on who have been the most influential people in the participants' lives in relation to selecting their specific program. To qualify as a theme across all programs, the theme had to be an area of discussion within all three programs and could not be unique in meaning to only one participant.

While it may be that students used the exact same words to form a theme, it was often the meaning behind the words, which when combined formed a theme. The lasting themes are also themes that were not contradicted by participants throughout the discussions. To qualify as a theme within one program only, it had to be an area of discussion within that program which was agreed to by more than one participant and was not contradicted by others within that program. These two themes are shown in no particular order in Figure 7.

- Family as influence. Mothers, fathers, aunts, uncles, grandparents, cousins, spouses, and girlfriends
- Teachers as influence. Conversations with program faculty members and experience with high school teachers

Figure 7. Who influenced students' career program selection?

Who influences. This study identified two groups of people who influenced students' decision to enroll in their occupational program.

Family as influence. Family is a strong influencer in participants' decisions to enroll in a one-year manufacturing-based occupational program. Family members include fathers, mothers, grandfathers, aunts, spouses, and siblings. Through the discussions, it was clear that opinions of

family members are very influential. One participant tried to explain this by saying, “No one knows you better.”

Fathers in particular are thought of as influential because of their ability to garner interest in an area through offering personal experiences for their children. In one case, a participant stated, “Experiences with my father gave me insight: dad was a mechanic. I learned how to fix basically everything on a farm; he’s taught me the basics.” Another participant said, “Dad needed a trailer rebuilt, taught me welding, I tore into it, patched up holes, and put it back together.” Another participant shared, “These experiences provide an opportunity to learn and also to recognize that it can be a lot of fun.”

One participant also reported that a father’s hobbies are also influential. An example of this was when one participant in particular said, “Dad’s always had a welding shop, and all three brothers are into it, referring to the idea that doing welding for fun was a motivating factor to try it as a career. Beyond providing experiences, at times, fathers also provide motivation to students to join the manufacturing career field. One participant reported his father telling him that “he could do it” while another student said his father “kicked me in the butt to get into it.”

Mothers, spouses, and significant others also have provided influence for some of these participants. In one case, a mother encouraged her son to “try a little of everything and pick out what you like and then go back for more.” In another case, a spouse instilled confidence in her husband to try it by stating, “You are smarter than you think, and you need to go do this. As the person who “stands behind me,” said one participant, spouses can provide positive support toward a goal.

Seeing significant others who are the age of a non-traditional students going to college has provided influence for one student. The participant explained, “My girlfriend’s six years

older than me and she's back in school. She wants to change her path. I thought, 'well I guess I'm not too old then.'" In other cases, more distant family members such as aunts, uncles, and grandparents have influenced these participants to enroll in a manufacturing-based occupational program. For one student, an uncle was a tool and die maker. The student remembered him and said, "I recall him talking, go into this field cause (sic) there's always jobs." While a grandfather's previous experience as a welder influenced a participant to select welding, another participant was given a welder at a young age by his grandparents. The grandfather told him "go and start putting stuff together." The participant obeyed and enjoyed doing it. He said, "I was frustrated, but I started to get stuff to stick: that got me interested in it." Enjoying what you do was the connection an aunt was able to make for another student, "she told of the programs they offer here and I realized you know firearms are a big hobby and passion of mine, and there was something in here that fit into that."

Who influences: Teachers as influence. Teachers at the secondary and post-secondary level have influenced the program selection by a few these participants. One recalled how "senior year I came here to an open house, I talked to a faculty member, it sounded pretty interesting." Another participant described how after setting a meeting with a faculty member, the faculty member described how the program was a good way to start a career in that so that just kind of sealed the deal right there. Participants reported about how faculty members have advised them on how their current skills qualify them for credit for prior learning or how another short-term credential would be a valuable addition to their skill set. In one instance, a participant with welding experience was told how he could add the electrical skill and could be finished in a year instead of selecting a two-year path. This participant said, "That's one less year making money," and enrolled in the industrial electronics program.

Another recognition of the influence a faculty member has on program selection was discovered when a participant said, “I would not have looked into this type of program on my own. It was kind of a good push.” Another student spoke of how a metals lab teacher allowed him to stay after school and help which built his interest level. Yet another student recalled how his high school teacher showed him how to weld and how he got pretty good at it.

Who influences: Unique to CNC students. While examining the data, one theme was found to be exclusive to the CNC program. That theme is shown in Figure 8.

- Unions. Promoting job opportunities

Figure 8. CNC program specific people who influenced career decision-making.

In occupations where unions have a strong presence locally, unions also influence the decision-making of students. One CNC participant spoke with individuals in the machinists union and reported being influenced by them. In this particular case, the participant met with people in Milwaukee, Wisconsin that told him there are many available jobs there. Another participant recalled that an apprenticeship offered through the union would allow a completer to “go pretty much anywhere.” He went on to lament how many people are “just not familiar with the journeyman programs.”

What influenced students to enroll. Responses related to research question three also revealed six specific themes that answered the question of what influences students to select their specific program. To qualify as a theme across all programs, it had to be an area of discussion within all three programs and could not be unique in meaning to only one participant. While it may be that students used the exact same words to form a theme, it was often the meaning behind the words which when combined formed a theme.

The lasting themes were also ones that were not contradicted by participants throughout the discussions. To qualify as a theme within one program only, it had to be an area of discussion within that program that was agreed to by more than one participant and was not contradicted by others within that program. A summary of these items listed in no particular order is contained in Figure 9.

- Access to CTE coursework. The ability to take CTE coursework while in HS
- Hands-on careers. The desire to have a job that allows for the physicality and creation of something
- Task variety. The ability to have variety within their jobs
- The program itself. Taking a program which is quick and technical focused
- Low academic self-efficacy. Poor prior academic performance in high school and the desire for hands-on learning
- Job opportunities. The number of perceived job openings in the field and associated pay

Figure 9. Themes showing what factors affected the students' decision to select their specific academic program.

Theme 1: Access to CTE coursework. Participants' experiences in high school provided influence in career selection. In particular, the ability to take CTE classes was a strong influencer. One participant was originally going to go into auto mechanics like his father had done. A local business donated welders and machine lathes to his high school, which then allowed him to take a course in metalworking. He described it saying, "I got into the metal shop and school ... I enjoyed it ... I decided to change and not do mechanics and do welding and maybe machining." Another described how he "related" with the metals lab teacher and stayed

after school to help with projects or how they “took all the shop classes in high school.” Another participant described how his welding teacher taught him how to be good at it. One participant went as far as to state that students “should be required in high school to take at least one shop class.” As part of this, a student described how “we had a technical college that you could take class at and leave high school early to go there and do that; that’s kind of how I started.” In one group of welding students, all ten revealed that they had taken a CTE course in high school before enrolling at the technical college.

Theme 2: Hands on careers. Participants overwhelmingly referred to the desire to do work that is “hands-on.” When selecting a career program, it was vital for the majority of them to find one which would be physical in nature. There was an expressed disinterest in any type of an office setting, which became evident through the remarks of one participant who said, “I was never really a paper pusher kind of person ... I don’t like sitting there, I like fixing things ... I want to do something physical ... I knew I didn’t want to sit in an office.”

Many participants also described how they grew up building things and enjoying doing just that. Several expressed interest in a job that allows them to do something that they like and will continue to do as a hobby when they retire. One welding participant smiled as he described with his words and hands how there “is just something about it that’s so cool ... see you strike that arch ... and metal just melting in a fire in that unified beam and your just like, man this is cool.”

Theme 3: Task variety. With hands-on experiences being sought, many participants in this study are intrigued and influenced to select their program by the variety that the manufacturing occupations can bring. Variety is thought to be present in the types of work done every day—the way in which their skill can be used outside of work, and even where the work

will be completed. This was consistent with participants earlier responses to career values. Several also discussed how the skills in this area can be applied to life every day. They reflected on the independence felt from doing things for yourself and the practical savings of the money you do not have to pay others to do things you can do. As a maintenance person, one participant said, "I'll probably never work on the same thing twice in a row."

Others described their desire to stitch together a career pathway through their completion of multiple one-year programs. As one student described it "you have all of the skill sets that you can decide which one you want to do." A welder relayed how "you could be welding a pipe one day, the next day you could be fixing something on a machine." The idea of being able to try new things and continually having variety in a job drives some of these participants toward manufacturing occupations. One particular student recalled how he has "never stayed in a job longer than two years." For him, the construction industry and the cycle of layoffs was something he prefers.

Theme 4: The program itself. The fourth theme of what influenced participants in this study to select their specific program came from the details of the program itself. In one instance, a welding student described how he knew Western's program was quality. For him, he was looking forward to the large fabrication projects. A few other students selected their program based on the fact that it was only a year in length. The idea of getting in and out quickly with a skill that can make them money was satisfying. To several others, having a program that could later be built upon to earn higher credentials is influential.

Theme 5: Low academic self-efficacy and the desire for hands-on learning. The various conversations with the participants yielded clues that for some a low academic self-efficacy was an influencing factor towards selecting their career program. As the participants continued to

share why they selected a manufacturing occupation, some conversations were focused on personally perceived lower sense of academic ability and a penchant for hands-on learning. One participant described it as “I’ve never been a learner of reading a book, I’ve always had to do it to understand it.” Another said “I found it easier than high school reading, or math, or English.”

The desire for formal, 4-year academic training was not there for these participants. One shared, “I did not do well in high school, I had no desire to go to college.” That statement was common throughout the focus groups. While some simply stated, “I didn’t want to waste the money on a 4-year degree,” others expressed a lack of confidence upon leaving high school. One participant shared how he came to a revelation at one point, “I needed a change in life ... never get to where you want to be ... I thought it was time to make a change and get the higher pay and accomplish some great things.” This led that participant into his manufacturing career program.

Theme 6: Job opportunities. The last reason participants provided for selecting their program was the belief in strong job opportunities and the associated wages. While some are currently employees who were laid off from the sector, there is still a belief that jobs are available wherever they want to go. Every participant believed that they would be able to find a job upon graduation and make what they called good money. As one participant described it, there is “steady pay and better pay.” Another expected that he would find “regular hours and scheduling, benefits, and good wages.” Another spoke about how “everything was turning electronic.” He asserted that his skill set then would be viable anywhere.

Several welders spoke of how they could go anywhere with their skill and make good money. These participants relayed a high perception of the job opportunities; however, when asked about the other manufacturing careers, they were less optimistic.

Barriers to enrolling in a manufacturing program. As part of research question 3, participants were asked about what else they wanted to share about what has affected their decision to enroll in a manufacturing-based occupational program. Their answers resulted in the formulation of one theme that is best described as barriers to enrolling in a manufacturing program. Through an analysis of the responses, five specific barriers were discovered. These five barriers are shown in no particular order in Figure 10.

- A lack of CTE opportunities in all program areas
- A lack of knowledge about the opportunities within other manufacturing pathway programs
- The 4-year push. Students feel pressured to attend a four-year college
- The stigma of vocational education. Students believe vocational education is looked down upon
- Popular culture. How movies influence our perceptions of manufacturing

Figure 10. Barriers that affect a student’s desire to enroll in a manufacturing CTE program.

Barrier 1: A lack of CTE opportunities in all program areas. While exposure to CTE coursework in high school was previously discussed as an influencing factor in a student’s decision to enroll within a manufacturing occupational program, through discussions it was evident that a lack of equal opportunities was also a barrier. Examples demonstrating this can be found through the comments of students such as one individual who “only got one shop class in seventh grade and touched the welders for a week.” Another recalled how that “by the time you got to high school, they [shop classes] were electives, so I just didn’t take any of those classes. I took advanced biology and chemistry instead.” A welding student described how he “never had a chance to work with the CNC machines or electronics, welding was more open.”

Others described the poor conditions of their shops within the high school. As one participant stated, “The metal shop was terrible. One of the welding machines was a helmet you couldn’t see out of and a broken drill press.” Another described how his school had a lathe within the wood shop but “you had to have special permission to use it.” Another described how what was available to him was “basically wood shop-type classes and a small engines class.” One disappointment for a participant was that “in high school, they don’t teach you a whole lot about electricity but every day you are in contact with it.” Thus, while CTE offerings were able to influence the participants when they were in high school, they hoped that they would continue to improve in the future.

Barrier 2: A lack of knowledge about the opportunities within other manufacturing pathway programs. As participants described why they selected their specific occupational program, they often described their program in a positive manner while diminishing the value of the other program within that cluster. CNC and industrial electronics students see welding as a declining field with limited job opportunities locally. One said, “If you’re young enough to move away ... but not for us older guys who are set with their family.” One participant questioned the viability of welding in particular as a career citing recent layoffs and Western’s recent push to graduate more welders. He referred to Western graduating roughly 30 welders a year and asked, “is there really 30 people retiring that year within 30 miles of here?”

Discussions went on to include one participant saying, “Right now in the La Crosse area at any giving time there could be 250 previously employed laid off welders plus the kids coming out of the program every year.” Adding to the concern over the viability of a welding career was the thought by one participant that “welding jobs may become automated, we won’t need those workers.” The same concern was expressed over machining. It was mentioned that “in this area,

it's not as good as the cities (Minnesota's Minneapolis and St. Paul)." Those who had selected welding as an occupation acknowledge that there is some automation; however, there are many types of welding that provide many different opportunities for jobs. It is germane to the study to recognize that 13 out of 14 (92%) of all the welding students participants in the study plan to leave the local district to seek employment.

The participants in each program area also view their own as being the most hands-on of the cluster of programs. Industrial maintenance participants pointed to the ideas that "a lot of things are going towards electrical" and that a person is needed to do those hands-on tasks. Someone needs to install the robots and to maintain them. CNC participants commonly believe welding is a good skill to learn; however, some think "you get more variety with what we do, with welding you are pretty much putting the same pattern on everything." When the welding participants spoke, this researcher heard about it being alright to work in a machine shop but "you don't get the satisfaction of actually hands-on, you technically make it but the machine did all of the work for you." While welding is "sewing with fire," with milling "half of the time you're just sitting there." The desire for variety and hand-on, physical work drives all of the participants in this study, but their perceptions of the various career options appear limited by their own paradigms.

Barrier 3: The 4-year push. Most participants reported feeling pressured or pushed to attend a four-year college. Several asserted that in high school "everyone was pushing a four-year school or you're never amount to anything. The majority of participants noted that since most high school teachers went to 4-year colleges that is the reason why they push it. Several also blamed counselors. One participant stated, "You need to get the counselors to take more of a role and show the kiddos the information and making them realize that there's a big

opportunity out there.” This concerns the participants because as one said, “Many of these students go to a 4-year and take generals, they don’t even get anything out of it, and have 100 grand of debt.” The point the participant was making was that not all jobs require a 4-year degree yet they were being directed that way. One asserted “there’s not a lot of jobs when everyone goes to a 4-year.”

Contrary to this, the participants agreed that technical colleges are more based on the type of career they will enter after finishing. For the majority, a technical education is viewed as being based on job availability and prepares them for a specific job in the workforce. The participants discussing this asserted “anyone knows how many jobs are available for people that go to a 2-year technical college.” For these participants, the consensus is most people think it is “an untraditional way to go.” Some participants alleged that this is due to following parents’ footsteps. One said, “Grow up and do what your parents did ... they just never consider a tech college was a possibility. They never heard of it. They do not know what it is. They just never considered it.” Many of the participants in these programs admitted that they “never heard much of technical degrees growing up: no one ever talked about it”. When it comes to advertising, again, the same participants reported not having heard of the trade’s fields growing up.

Barrier 4: The stigma of vocational education. The majority of participants in this study acknowledged a stigma of CTE courses and programs for related jobs. Some proclaimed that the stigma involves not being “smart enough” to go to a 4-year school.” One participant shared, “When you say you’re going to a 2-year college, they just shake their heads like that doesn’t mean anything.” Another student described how he felt people viewed vocational education as preparing for jobs where the work was all dirty. While some of the participants also revealed feeling discouraged by this stigma. They insisted that starting out with a short-term technical

diploma leaves room for advancement. As one participant put it, “you’re way ahead of people with a 4-year degree.”

Barrier 5: Popular culture. All focus groups referred back to popular culture as being a driving force of the negative image of vocational education and manufacturing and thus a barrier to students enrolling in related vocational programs. Several students cited the movie “*Cinderella Man*,” which takes place in the 1930s and focuses around boxing. Although the focus is boxing, several participants recalled a scene where someone walks out in a brickyard and says, “you, you, and you, you get to work today.”

For the participants, discussing the movie represents an image where anyone can be picked off the streets to perform manufacturing work. They pointed out that in historical movies, “factories are always dirty, grungy, employees are always getting yelled at, and people are always dreading it.” When the participants see this in movies, it forms an image that is not necessarily aligned with the reality of today. One participant who has had the opportunity to tour General Motors recalled the event: “It looks like nothing we’ve ever seen. It’s clean and up-kept, manufacturing is relatively clean compared to what my whole thought process was.” All participants in that focus group shook their heads in agreement.

The consensus was that we have to show what things are like today. One particular participant acknowledged being surprised by the technology that manufacturing businesses are using today.

Summary

This chapter detailed the results of the thematic analysis which was conducted after qualitative focus groups were completed. Discussions with students across the program areas of CNC, welding, and industrial electronics maintenance revealed primary themes about the

perceptions they hold of manufacturing, the work values they hold, and who and what has influenced them to select their specific manufacturing based occupational program.

Through the analysis, it was revealed that the participants in this study hold primarily negative views of the work of manufacturing. The term manufacturing itself, employee management relations, and working for what they described as large organizations are not positives. These participants also acknowledged being pressured by others around them to view manufacturing in a negative way.

All participants confidently expressed that there are an abundance of job opportunities within their field and that they could make a good living at it. They described two types of manufacturing. The first type of manufacturing is associated with the negative stereotypes discussed, which these participants asserted do not align with the jobs they are going into. Instead, they more closely associate their programs with those in an advanced manufacturing setting, which they proclaimed requires higher skill sets and provides better earning potential. Participants enrolled in the CNC program view unions in a positive light. The topic of unions was not discussed by either of the other two manufacturing programs (welding and industrial electronics maintenance).

Through a voting process, the top five work values of participants were discovered. Of these five, each program area values the same three work values of income, variety, and job security. The welding and CNC program participants were consistent in the five most important work values identified. The industrial electronics maintenance students value workplace less and instead value lifestyle and supervision.

Research findings indicate that students are primarily influence by their family members (immediate and distant) and teachers (secondary and post-secondary). Again, the CNC students

were slightly different in that they highlighted unions as being influential in the decision making process. Additionally, participants identified that exposure to CTE courses in high school, along with the desire for a hands-on career with good job opportunities and an opportunity for variety in their work duties influenced them to select their specific program. Moreover, the desire to complete a short-term program and the lack of desire to pursue an academic based program were also cited by students.

The participants in this study perceive several barriers toward their desire to enroll in a manufacturing-based occupational program. While all of the welding student participants had an opportunity to participate in CTE coursework before enrolling, very few of those in machining or industrial electronics had that opportunity when it came to machining or electrical coursework available in high school. Participants also shared that the early exposure to CTE coursework is critical in developing interest in the manufacturing programs.

There appears to be a lack of clarity regarding career opportunities that exist in other manufacturing pathway programs in which the participants are not currently enrolled within. While they understand the wages and job openings available to their own program, they tend to think that those same opportunities did not exist for the other programs.

During all focus groups, participants discussed how they were pushed while in high school to attend a 4-year institution. They asserted that many view vocational programs in a negative light and are not familiar with the opportunities that those programs can bring. According to the participants, this may be due to the lack of exposure in CTE coursework, the lack of a parent working within those occupations, or from how manufacturing is portrayed in movies.

The results of this study presented in this chapter reveal the primary findings of this study. Chapter 5, we will summarize these results, arrive at conclusions and implications of the results, and provide a set of recommendations to employers and administrators in the secondary and post-secondary schools.

Chapter V: Summary, Conclusion and Recommendation

The purpose of this study was to identify why students selected their specific post-secondary, short-term credential, manufacturing based career program, their perceptions of manufacturing, and what work values they hold. By understanding influences, both positive and negative, this study will have the opportunity to inform future marketing efforts and help administrators in decisions related to raising enrollments in these programs. By understanding the factors that affect student enrollment and identifying what work values the future workforce holds, it could also help local manufacturing companies promote their open positions by reviewing how they structure the work and career opportunities within their place of employment.

For every manufacturing job, an additional 2.2 jobs are created through the total supply chain and support activities (Hessman, 2015). This makes manufacturing a direct driving force of the U.S. economy. Adoption of technology has changed the manufacturing environment to be more focused on science, technology, engineering, and math (STEM) resulting in an increased need for higher skills and increased levels of education for employees (Hessman, 2015; Salopek, 2007). Unfortunately, as people continue to leave the industry through retirements (Fehrenbach, 2014), interest in manufacturing careers and manufacturing programs has shown a decline (Sullivan & Haltinner, 2016; U.S. Commerce Department, 2015). This is and continues to result in a shortage of qualified workers to meet the demand (Brown, 2015; Fehrenbach, 2014; McMenamin, 2015).

CTE exists to prepare students for careers upon completion of high school or college (Gentry et al., 2007). As a result, students currently enrolled in the one-year manufacturing program of study in welding, CNC, and industrial electronic maintenance were invited to

participate in focus groups. The focus groups were comprised of students and their peers from their respective program areas. Through the focus group process, participants were able to describe how their own experiences ultimately affected their decision to enroll in their manufacturing program of study. Twenty-eight participants from one-year programs were led through the process via the use of a moderator script and standard interview protocol during the 75-minute process. In addition, clarifying questions were sometimes required to be specific to one group for this researcher to draw out additional meaning of comments made.

Summary/Discussion

This study identified common perceptions that students currently enrolled in a short-term manufacturing based occupational program hold about manufacturing, what work values they hold, and who, and what influenced them to select their specific occupational program. A summary and discussion of the research findings is presented below.

Students' views of manufacturing. Responses provided were based upon students' own perceptions which were derived through their own experience or experiences of others. The responses elicited were primarily negative, with participants viewing manufacturing as lower skilled, lower pay, repetitive, and dirty type of work. Coupled with that was the common view that employers do not value their employees, which was expressed by participants fearing layoffs and management that would not trust them. The negativity was primarily focused around what was described as large employers.

Part of the negativity towards manufacturing came from the connotation of the word manufacturing itself. All participants viewed the term *manufacturing* less favorably than the term *advanced manufacturing*. To the majority of them, manufacturing elicited the thought of old factories, poor working conditions, and assemble line work, which requires no skill. By

contrast, they associate advanced manufacturing with requiring higher skill, providing cleaner work environments, and being more technology focused.

Participants did assert that manufacturing jobs could provide good pay and benefits and could also be a good career if someone enjoyed that kind of work. This was where terminology came into the focus group discussions. All participants in the welding, CNC, and industrial electronics maintenance programs do not believe their programs are or should be classified as manufacturing. They believe that the term itself creates negative feelings and that others around them look down on people who openly assert that they are pursuing manufacturing as an occupation. Feelings about manufacturing were elevated higher among CNC students when the work environment was associated with having a union presence.

Students' work values. What employees' value within a job was the focus of the second interview question.

Income and job security as work values. Participants in this study overwhelmingly desire a good, steady paying job as their first value. They believe that their occupations will provide for enough money to live their life, support their families, and support their hobbies. The primary desire to secure a good income was supported by participants expressed values of job security and variety. Many knew of others in the industry that had lost their jobs to business contraction. To the participants, having a steady job is essential to everything else in life. While some viewed the ability to earn more money through overtime as a positive thing, others appeared to resent when it was forced upon them.

Variety as a work value. Variety was defined as being able to do different things each day, to work in different settings or departments, and the ability to learn more skills that would

enable them to climb in rank. Participants stressed that variety within the workplace keeps it engaging and provides for a more stable financial future.

Supervision and workplace as work values. The majority of participants also valued the relations with their supervisor and a clean and safe work environment as being in their top five of importance. They desire a supervisor who trusts, respects, and appreciates them, which leads to job satisfaction and conversely, if not present, can lead to dissatisfaction. Working in an environment where safety is valued, where equipment is maintained and relevant, work areas are clean and organized also leads to greater job satisfaction.

Lifestyle and co-workers as work values. Within the industrial electronics maintenance program, it was discovered that the work values of lifestyle and co-workers are very important. Students in this focus group spoke about desiring a job that allows them to balance their life. For many of them, work itself is not as important as having time for family or personal hobbies. Additionally, they desire to work with others whom they were able to get along with. Having co-workers who make the job enjoyable is important.

Who and what influences students' career decision-making process. The final interview questions focused on understanding who influences a student's career decision, what experiences or events influence the decision to select manufacturing, and anything else that the participant wished to share about their career decision making process.

Who influences. This study identified two groups of people who influence students' decisions to enroll in their occupational program: families and teachers.

Throughout all focus groups, it was identified that family and teachers are the primary influencers. This finding is consistent with previous research highlighting the importance these groups play in decision-making (Ausman, et al., 2013; Chakraverty & Tai, 2013; St. Gean,

2010). Family is the most influential by at times providing explicit direction and at other times just by having a family member who has been employed in a similar occupation themselves. Additionally, family is often responsible for providing opportunities for children to try out a skill such as welding or machining.

For participants in this study, teachers are influential both at the secondary and post-secondary levels. Personal relationships appeared valued while career guidance from a teacher helped them to narrow down their career interests.

What influences students' career decision-making. This study revealed six reasons why participants selected their manufacturing occupational program.

Access to CTE courses in high school. Participants' past experiences weigh heavily on how they select a career. Experiences in high school, both positive and negative, result in a student developing or not developing an interest in a specific occupational area. Those who had an opportunity to take a specific shop class reported that it peaked their interest and provided for a sense of enjoyment; however, many pointed out that their own high school does not offer many opportunities for CTE courses. The high school that do often have outdated or minimal equipment.

The desire for a hands-on career and variety in a job. A desire for a hands-on career with variety of responsibilities and career opportunities was a common reason for all participants selecting their occupational program. Participants in this study find enjoyment in working with their hands and reported that doing repetitive tasks would be negative.

Low perceived academic self-efficacy and the desire for a short-term program. This study revealed that some of the participants doubt their own academic ability. They reported performing lower in traditional academic subjects and a preference to learn kinesthetically,

which has resulted in them pursuing a manufacturing-based career program. The lack of confidence keeps some of them from desiring to pursue a 4-year degree while in other cases some simply desire to join a program that is short in length and provides an opportunity to quickly obtain a job.

Job opportunities. All participants in this study are confident that their specific program will lead to job opportunities. The jobs were viewed favorably in terms of income with the expectation of a minimum earning potential of \$40,000 annually.

Barriers to enrolling in a manufacturing program. This study also revealed five barriers students face when selecting a manufacturing career occupation.

The push toward a 4-year degree and the stigma of vocational education. Most participants reported feeling pushed at the secondary level to go to a 4-year college degree program. Participants in this study reported being viewed unfavorably when expressing an interest in a shorter-term CTE program, and that most people do not understand the career opportunities associated with these degree programs. Part of the stigma around vocational education is assumed by the participants to come from a lack of CTE awareness by teachers and counselors at the secondary level in addition to how manufacturing in particular is portrayed in the movies.

A lack of CTE opportunities in high school and a lack of knowledge about career opportunities within manufacturing. While many students reported having positive views of the CTE offerings they had in high school, it was clear that the variety of offerings and access to them, was not as much as students desired. This has led to a lack of knowledge in regards to job opportunities in all manufacturing career paths.

Popular culture and how manufacturing is represented is a barrier toward enrollment.

This study revealed that students' views of manufacturing are influenced by what they see on television and within movies. When they see depictions of manufacturing as it was in the 1930s, it creates a paradigm for how they view manufacturing. For those who do not have other experiences to balance that image, it becomes hard to overcome it.

Conclusions

The focus group protocol aligned with the three research questions to learn the perspective of students who had chosen manufacturing as a career option, why they did so, and what would help to recruit more people into the manufacturing occupations and programs. Perspectives were gathered from individual program areas and later aggregated for a broader understanding of the beliefs, experiences, and perceptions of the manufacturing student. Together, these discussions led to a greater understanding of why these students selected the career path they did.

Research question 1. Participants responded unanimously that in their own views, there are two types of manufacturing: manufacturing and advanced manufacturing. According to them, manufacturing of the past still exists today, and it requires a lower skill set, is repetitive, provides low wages, takes place in low lit and un-kept facilities, and is undesirable to them. When the term manufacturing is used, many participants relate it directly to large assembly lines typically seen during the 1930s. This findings supports previous research which has shown that a negative perception of manufacturing exists (Modern Machine Shop, 2012; ReWeick, 2014).

Some participants believe that many of the larger organizations are where you would find typical manufacturing jobs as they described them. In these larger organization, participants asserted that workers are less appreciated and disconnected from the owners, which leads to an

increased possibility of being subjected to a lay off. Because of this, they have a more favorable view of smaller companies where they assume they have more opportunities to try new things, to learn and grow, and to enjoy their work.

Advanced manufacturing is different than manufacturing and requires post-secondary education, provides more career opportunities and pay, and utilizes updated technology. Participants in this study associate their own career programs as being closer aligned to advanced manufacturing than manufacturing. They identify welding, CNC, and industrial electronics maintenance as advanced manufacturing occupations, which aligns with the definition provided by the President's Council of Advisors on Science and Technology (2012). The current pathways organization, however, does not segregate between manufacturing and advanced manufacturing, thus all related jobs are organized into one generic cluster (Blosveren, 2015; Schmidli, 2001).

Although participants admit to having a primarily negative opinion of manufacturing work, they also express the belief that it does not have to be negative. There is a common belief that there are good career opportunities, especially when the work can be classified as advanced manufacturing. For participants in this study, the primary distinction between traditional and advanced manufacturing comes from the required skills needed and the technology utilized. This is supported by the literature review, which shows that manufacturing has become more complex and incorporates higher levels of technology (Brown, 2012; Hessman, 2015). Conversely, the negative image associated with traditional manufacturing is also supported by the responses of participants in this study. These findings show that although some manufacturers have progressed, manufacturing still suffers from an image problem, which could affect employment interest levels in the future.

Research question 2. When reviewing Super's revised work values inventory and the 12 associated categories (as cited in Robinson & Betz, 2007), the top five work values of manufacturing students in this study have been identified. When all programs are aggregated as one population of manufacturing students, the work values of income, job security, workplace, variety, and supervision become the top five work values. When comparing work values across programs, all groups weigh income, job security, supervision, and variety as top five work values. While the industrial electronics maintenance program students in this study place more value on lifestyle and co-workers than welding and CNC students, participants from all programs initially made statements that relate to valuing these two other work values. This finding is similar to previous findings where work values across large groups of hospitality students were found to be consistent (Chak-Keung, & Jing, 2009). The findings in this study may imply that among homogenous groups of individuals within specific occupational programs, a common set of work values is possible.

In this study of male students in manufacturing occupational programs within a narrow age demographic, the values of income, job security, supervision, and variety, are consistently the most important factors in their career choice. Income is seen as being the primary desire. It is connected to being able to live one's life. Participants reported a range of \$40,000-\$50,000 as being a reasonable wage expectation. With income, job security was also rated high as it directly affects the work value of income. The participants see instability in one's job as producing struggles outside of the job.

The work value of variety arose at several times throughout the study. A job that has little task variety is associated more closely by participants with the paradigm of traditional manufacturing than it is with advanced manufacturing by the CTE students in this study. Variety

is also a factor that could make a job undesirable if not present. Individual and professional growth is closely associated with variety and sought after.

The average age of participants in this was 25.29 years with a mode of 19 and range of 45. The frequency of participants between ages 18-20 was 67.86%, which indicates that of participants were under 21 years of age. The importance of this comes from comparing it to previous findings by Jin and Rounds (2012), where they found that work values tend to change from intrinsic to extrinsically after the age of 22. According to Super (1962), the work values of income, job security, supervision, and variety are all external values. Thus, the findings in this study support the findings of Jin and Rounds (2012). However, drawing a clear conclusion from this is challenging because of inconsistencies in how the work value of variety is defined. Variety, as used by the participants in this study, may represent an internal or external value (Vodanovich et al., 1997).

Research question 3. A clear picture emerged of who and what influences students to select not only a manufacturing career but also their specific CTE program.

Who influences students. Family, both immediate and distant, provides encouragement to go in the direction of a manufacturing career, but also providing experiences for students to develop interests are a reason as well. A parent's or relative's involvement in a similar career was mentioned frequently as a way in which participants in this study are influenced to take on this type of career move. Family also has been previously identified in studies as being influential in the career development process (Ausman, et al., 2013; Chakraverty & Tai, 2013; Lee et al., 2010; St, Gean, 2010). Thus, the results in this study further strengthen that position.

Faculty at the secondary and post-secondary level helps students who are otherwise unsure to select a direction. The personal meetings with faculty were, at times, the critical factor

that solidified a student's decision. The participants in this study value face-to-face meetings and appreciate hearing advice from someone outside of the secondary teacher or counselor. In one reported instance, a meeting with a faculty member actually caused a participant to go against the direction of their parent's own career. The value of faculty having one-on-one meetings with potential students is thus underscored. Additionally, some participants shared how a secondary teacher allowed them to learn the basics, to develop and interest, and therefore influenced them in their career choice.

Unique to CNC student participants is the influence of unions on their decision-making. Union membership can affect a student's career decision-making process. When representatives of trade unions promote the amount of job openings available, the potential pay, and encourage participation, it positively affects a student's decision in a manufacturing career.

What influences students. The second part of research question 3 further sought to examine career development theory by identifying what experiences influence a student's career decision. The participants in this study overwhelmingly assert that experiences within high school or at home gave them an initial interest in a manufacturing career field. This feeling aligns with SCCT (Lent & Brown, 1996; Lent & Hackett, 1999), whereas when a person has an opportunity to experience something, they can then build confidence in their own abilities in that area, which can later translate into goals related to such.

Participants in this study also reported a desire to be engaged within a career that involves them manually engaging with the work. Physical work is not a deterrent as long as they enjoy the work itself. Part of enjoying it involves the ability to continually grow and learn additional skills while also having the opportunity to perform a variety of tasks and avoiding work that is repetitious.

Related to the desire to perform hands-on work, was a stated preference for hands-on learning, which is focused more on the technical side than the academic side. Participants in this study frequently reported that they did not perform well in secondary school and had little desire for a 4-year degree path. In some cases, some of these participants stated that they “fell back” into a manufacturing career occupation due to a lack of success in high school. Others within the study purposely selected a technical education in order to “get in and out quickly,” preferring this path to a four-year degree path. With the mixed reasons for selecting a short-term manufacturing program of study, this demonstrates the importance of providing short-term, skills-based programs that lead to immediate employment opportunities.

Why students selected their specific program over another manufacturing program.

Using the career pathways and career clusters framework (Schmidli, 2001; Wisconsin Career Pathways, n.d.c), an attempt was made to understand why participants in this study enrolled in an occupational program classified as falling within the manufacturing cluster and selected their occupational program among other pathways available within that cluster. While all participants presumed that their own career program will result in job opportunities, each focus group was less certain when it came to other manufacturing-based programs. Recent layoffs within the community combined with an increased number of welding graduates locally have caused some CNC and industrial maintenance students to doubt the security of a welding career. There is also a belief that automation will soon replace many of the workers currently performing welding and CNC roles.

The Welding student participants in this study expressed doubt about the local economy providing desired job opportunities. As a result, the majority of these participants intend to leave their local school district to pursue career opportunities elsewhere. With local job modeling

projections showing growth in the three program areas, this is a concern for the future availability of workers. Overall, participants do not seem to understand the career opportunities outside of the specific program area they are currently enrolled in.

Most participants shared that they were pushed toward pursuing a 4-year degree program. The majority of the pressure comes from peers and counselors within the secondary school system. A lack of awareness of the career potential of manufacturing occupations is believed to be the reason for the pressure, which is associated with the perceived stigma around vocational programs and careers. Some participants reported being looked down upon whenever they expressed interest in manufacturing, and they have not been comfortable sharing their plans as a result. The stigma of vocational education and perceived pressure to pursue a 4-year degree path may be reasons why enrollment interest in CTE courses has been found to be low to moderate (Haney, 2002).

Participants cited that participating in CTE courses within high school is an important reason for selecting a manufacturing-based occupational program. It should be noted, however, that many participants are displeased with how many different CTE course options they have. A lack of access to equipment and courses and accessing out of date equipment were mentioned as deterrents. While welding was a prominent course offered in high school for these participants, access to electronics and machining courses has been less prevalent. This may explain why more students go on to enroll in welding than the CNC and industrial electronics maintenance programs combined.

The last item that several of the participants in this study wished to share was their belief that the negative image of manufacturing is a result of what people know about it. If students do not have the opportunity to experience this as a career option first-hand, their only understanding

of it may come from what they hear from others and within the movies. Movies were cited as portraying an image most closely aligned with manufacturing of the 1930s rather than what manufacturing is today. Many of these students believe that once people see the technology involved and the pay associated with modern manufacturing, their perceptions and opinions will change.

Recommendations

Career selection by students is a complex task which is influenced by many factors. To increase interest within manufacturing as a career path at Western Technical College, actions should be taken at the secondary and post-secondary level, as well as among employers. With a reportedly negative stigma associated with both CTE offerings and manufacturing as a career cluster, it will take a joint effort to overcome, thus collaboration between schools and industry is needed.

Recommendations for employers within Western's district. It is recommended that local manufacturing employers within Western's district consider doing the following:

1. Develop relationships with the local secondary schools where businesses open their doors for tours and provide career speakers at the secondary level
2. Consider capital investments within local school districts to allow for additional CTE course offerings and increased access to lab equipment specific to business processes
3. Ensure that manufacturing facilities reflect modern, advanced manufacturing by the adoption of technology and an investment in a bright, clean, organized, and safe work environment

4. Examine job structures to allow for cross-training of employees and work with technical colleges to develop pathway training in order to bring an employee through a career path
5. Market the potential wages, career paths, and number of job openings available within the organization
6. Establish formal supervisory training programs for leadership within the organization to ensure that supervisors are prepared to effectively manage the workforce
7. Form or expand paid internship opportunities during the summer months to promote youth to engage in the advanced manufacturing career sector

Recommendations for technical college administrators at Western. It is recommended that technical college administrators at Western consider doing the following:

- Stop using the term manufacturing in all marketing and promotional material for the programs of welding, CNC, and industrial electronics maintenance and instead replace it with the words “advanced manufacturing”
- Partner with the local secondary schools and businesses to provide hands-on experiences aimed at promoting advanced manufacturing careers and employers
- Highlight the wages, job openings, and the opportunity to engage in a hands-on career to potential students
- Grow transcribed credit opportunities with secondary schools and consider joint grant applications to acquire additional equipment which could lead to an increase in CTE offerings at the secondary level
- Perform outreach to secondary teachers, administrators, and staff in order to raise awareness of advanced manufacturing as a career path

- Identify ways to further engage faculty with secondary school students, teachers, and counselors
- Explore the creation of additional internships or job shadows for students with local businesses

Recommendations for high school administrators in Western’s district. It is recommended that secondary school administrators in Western’s district consider doing the following:

- Encourage attendance by staff and students at local technical college open houses, career fairs, and other engagement events
- Identify grants or other funding opportunities that can expand the equipment for offerings of CTE courses related to high demand occupational areas
- Expand opportunities for students to explore local advanced manufacturers within your own institution and outside of it to identify career opportunities
- Work with local businesses and the local technical and four-year colleges to identify career pathways training that begins in secondary school and progresses to the post-secondary schools and employers
- Work with post-secondary institutions and employers to develop communications aimed at parents regarding career opportunities for students

Recommendations for future research. In addition to recommendations for employers and secondary and post-secondary schools, the following research is recommended:

1. Replicate this study by including focus groups of manufacturing students across other colleges within the Wisconsin Technical College System to understand if similar paradigms of manufacturing exist and if a similar common set of work values emerge

2. Build upon this study by including secondary school administrators and counselors in an efforts to understand what paradigms they hold about manufacturing careers
3. Build upon this study by including employers and determining what work values most closely align with the job openings they provide. The results of this can then be compared to the work values of the manufacturing student to identify congruence
4. Perform a qualitative study reviewing how popular culture affects the perceptions of careers by secondary students
5. Perform a quantitative study comparing the type of CTE course offerings at local high schools to the enrollment interest in Western's career programs to see if a correlation can be found between students taking a specific CTE offering and later enrolling in a similar vocational program

Summary

This study concluded that the term manufacturing generally elicits unfavorable responses from students currently enrolled within a manufacturing based program of study at Western. Perceptions of manufacturing reflected what many students referred to as “manufacturing of the past,” which includes repetition, low skill assembly line work, which takes places in a dirty and dark environment. By changing the terminology to advanced manufacturing and highlighting the technology in use today, a more positive view emerges. The study also found that the manufacturing students at Western are most concerned with the work values of income, job security, supervision, and variety. These students generally seek a job that pays enough money to support their lifestyle; is secure; allows for learning new skills and duties, which may lead to advancement; and takes place within a work setting that is clean, organized, safe, and under the supervision of those who respect and trust them.

Family and teachers influence students' decisions to enroll in a one-year manufacturing based occupational program. The greatest influence is immediate family; however, it was discovered that post-secondary faculty have the power to be more influential when they take the time to share what career opportunities exist in manufacturing with students. Additionally, the opportunity for students to engage in hands-on activities related to welding, CNC, and industrial electronics maintenance at home or within high school provides an initial interest, which later leads to the participation within a manufacturing program of study. While CTE offerings in high school provide many students with the interest to pursue a similar vocational program, students would like to see more variety of offerings as well as access to more current equipment.

This study also revealed a pressure on students to forego technical education in favor of a four-year degree path. Pressure was felt from peers and high school counselors, which have resulted in students questioning their decision and withholding the expression of their interest or intent. The perceived push towards a 4-year college is a barrier for students interested in pursuing manufacturing as a career.

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Appendix A: Moderator Script

Stage 1- Introduction (10 Minutes)

Welcome and thank you for agreeing to take part in this study. As you may already know, our employers are telling us that there is a continued need for skilled employees within your industry sector. Placements rates are high for those who select and then graduate from your program area. Unfortunately, in many cases, there are not enough students selecting this career path to fulfill the current and expected demand. This is creating a skills shortage which could ultimately affect our local and state economy.

Since you are currently enrolled in a one-year program within this sector, this study will look for specific ideas from you in relation to the three research questions. Additionally, we will be organizing some of these ideas into themes and ranking some portions.

As we go through the process, I encourage you to openly share your own ideas, even if they are different from the ideas of others.

The results of this research will be shared with the academic community however no one will be identified individually. Specific quotes or thoughts will be recorded but the responses will be aggregated among all responses. Please do not share the thoughts of this group with others outside of the group itself, including other program students.

I will be audio recording this focus group through the Rev App on my phone. The audio recording will then be transcribed through that service and the transcript used for further analysis. I will not share the audio tape and will not release the audio for public review.

On the table in front of you is a consent form for participation. Please take a moment and sign that form and I will collect those. If you are unwilling to provide consent, you will be unable to participate in the study and are free to leave the focus group.

Now that we have an understanding of the process, I would like to begin. Before we do, what questions do you have about the process? Great, let's go around the room and do introductions. For the introduction, please state your age, whether or not you have a family member working within the manufacturing sector, and if you yourself have ever worked in this sector previously.

Stage 2- Question Number 1 (20 minutes)

To start off, I am going to pose a question to you. In front of you, you will find a pad of sticky-notes and a pen. After I ask the first question, please record your thoughts on the sticky-notes. Only record one thought per sticky note, using as many sticky notes as needed. You will have five minutes to record your thoughts independently.

Q. 1 When you think of working a manufacturing job within a manufacturing setting, what specific thoughts come to mind? Take five minutes and record your thoughts. If you finish sooner, raise your hand and I will collect your responses and post them to the board.

Now, let's hear your thoughts. We'll spend 15 minutes and go around the room now and hear what each of you has said and post your ideas for review. From there, we will see if you can organize them into themes or categories. *(Moderator goes around the room and hears the individual ideas and asks the group to organize these into themes). Follow-up question, what made you think that? Does anyone have additional thoughts which haven't yet been shared? Why do you think our thoughts are different? Would anyone agree or disagree with any of those ideas presented here?*

Stage 2- Question Number 2 (25 minutes)

Q. 2 What are the top three things which are important to you in a job? Liking it would not be specific enough. Again, take five minutes now to record your own thoughts.

(Moderator) Once the five minutes is up, collect the notes and read them aloud while placing them on the whiteboard.

Now, let's hear your thoughts. We'll spend 15 minutes and go around the room now and hear what each of you has said and post your ideas for review. From there, we will see if you can organize them into themes or categories. *(Moderator goes around the room and hears the individual ideas and asks the group to organize these into themes). Follow-up question, why is that important to you? Can you explain to us why you value that more than other items listed? Please help me understand what you mean by that. Has your opinion on this changed over time? Why is that?*

Now that we have recorded all thoughts, I am going to ask you to rank your top five thoughts in order of how important it is to you or how much you agree with it. Looking at the list, take five minutes and this time, rank the five most important things you value in a job. In front of you is a voting sheet, write in one idea per line, starting with the most important item at the top, followed by the next important. We have five minutes for this portion. *(Moderator, collect the responses after five minutes).*

Stage 2- Question 3 (20 minutes)

Again, only record one thought per sticky note. Take five minutes and write down:

Q. 3 Who and what influenced you to select this specific career program?

If you finish sooner, raise your hand and I will collect your responses and post them to the board.

Now, let's hear your thoughts. We'll spend 15 minutes and go around the room now and hear what each of you has said and post your ideas for review. From there, we will see if you can organize them into themes or categories. *(Moderator goes around the room and hears the individual ideas and asks the group to organize these into themes). Follow-up question- Why not another manufacturing program such as welding, CNC, or IEM? What would have made you consider a different program? How long have you known that this was the program you would enroll in? Help me understand how that influenced your decision.*

Wrap-up (5 minutes)

Thank you for your input thus far. Now I would like to take some time to discuss what else you would like to add to the discussion. Specifically, how else can we help to solve the issue of a workforce shortage in the manufacturing occupations?

Is there anything else you would like to add which we did not discuss?

Appendix C: Faculty Request

Hello. As you may already know, our employers are telling us that there is a continued need for skilled employees within your industry sector. Placements rates are high for those who select and then graduate from your program area. Unfortunately, in many cases, there are not enough students selecting this career path to fulfill the current and expected demand. This is creating a skills shortage which could ultimately affect our local and state economy.

Since you are currently teaching students who are enrolled in a one-year program within this sector, I would like to ask for permission to attend one of your classes. While there, I would like to have a discussion with your students regarding participating in a study which looks at their perceptions, what they value in a job, and why they selected their specific program. I would spend no more than ten minutes in your class and provide students with the information regarding this study.

Please let me know by 2/03/2017 if you are alright with me coming into one of your classes and speaking with your students. If you have additional questions or desire to confirm my request, please reply back via this e-mail message and state which dates and times work for me to attend. Thank you for considering this request.

Sincerely,

Josh Gamer

Appendix D: Student Participation Request Script

Hello. My name is Josh Gamer and I am in the Ed. D in CTE program at UW- Stout. Currently, I am the Dean of the Integrated Technology Division here at Western Technical College. As you may already know, our employers are telling us that there is a continued need for skilled employees within your industry sector. Placements rates are high for those who select and then graduate from your program area. Unfortunately, in many cases, there are not enough students selecting this career path to fulfill the current and expected demand. This is creating a skills shortage which could ultimately affect our local and state economy. Since you are currently enrolled in a one-year program within this sector, I would like to have a discussion with you regarding your perceptions, why you selected this specific occupation, and what you value in a job.

The process will take approximately 75 minutes and will include up to seven additional peer students from your program area. There will be a facilitated list of questions and open discussion within a group setting. Once completed, a qualitative analysis will be conducted to identify common themes from the three program areas of CNC, welding, and industrial electronics maintenance.

Thank you for considering the opportunity to participate in this study. Please note that this is completely voluntary and if you are interested and willing to participate, please write down your name and student ID number on the sheet which your faculty member will pass around. Once you confirm, I will send you an e-mail including the meeting date/time. Your personal information and your individual responses will be confidential.

On the day of the study, I will provide soda, water, and snacks. Please let me know if you have any specific dietary requirements. My contact information is:

Josh Gamer
gamerj@westernnc.edu
Cell- 608-386-4972

Appendix E: Student Follow-up

Hello. Thank you again for agreeing to participate in my study. The process will take approximately 75 minutes and will include up to seven additional peer students from your program area. There will be a facilitated list of questions and open discussion within a group setting. Once completed, a qualitative analysis will be conducted to identify common themes from the three program areas of CNC, welding, and industrial electronics maintenance. Before arriving, please take a moment to read the following three questions which will be discussed during the study.

1. When you think of working a manufacturing job within a manufacturing setting, what specific thoughts come to mind?
2. What are the top three things which are important to you in a job? Liking it would not be specific enough.
3. Who and what influenced you to select this specific career program?

Please be sure to arrive on time so we can conclude in the time allotted. The location of the study and time is listed below:

Date: _____

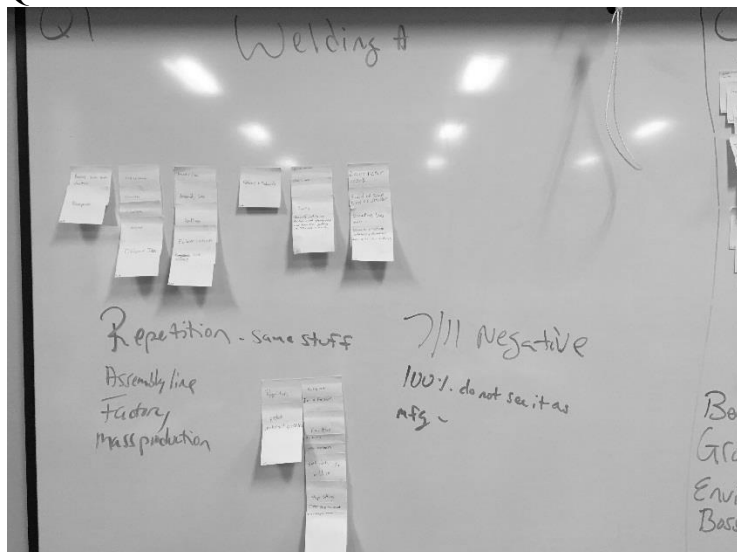
Time: _____

On the day of the study, I will provide soda, water, and snacks. Please let me know if you have any specific dietary requirements. I look forward to speaking with you shortly. My contact information is:

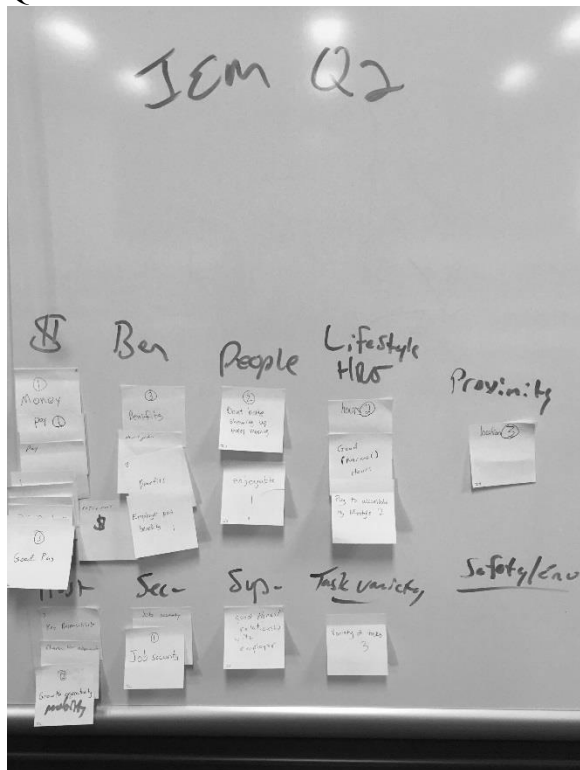
Josh Gamer
gamerj@westernnc.edu
Cell- 608-386-4972

Appendix F: Student Developed Themes; Example

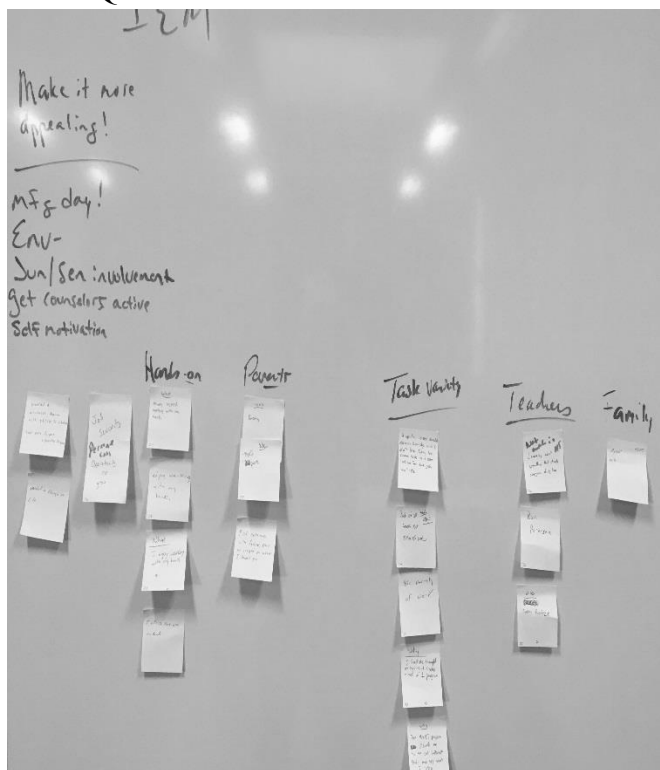
Q1



Q2



Q3



Appendix G: Student Work Values Ranking Sheet

Question number 2 asked you to identify three things which you value most in a job. Looking now at the larger class list, please take a moment to rank those items most important to you. Record your most important items first, followed by the second most important and so on.

Most important things in a job	
Second most important thing in a job	
Third most important thing in a job	
Fourth most important	
Fifth most important	

Appendix H: Work Value List

Achievement- Achieve a feeling of success from a job well done

Co-Workers- Have good interactions with fellow workers

Creativity- Can try out new ideas

Income- Receive pay raises and income which keeps ahead of the cost of living

Independence- Can make my own decisions

Lifestyle- Have time enough for leisure and family activities

Mental Challenge- Always has new problems to solve

Prestige- Know that others think my work is important

Security- Know that my position will last

Supervision- Have a boss who treats me well

Variety- Do many different things to get my work done

Work Environment- Work in a good place (clean, warm, well lit, etc.)

Appendix I: UW-Stout IRB Approval



Office of Research and Sponsored Programs
152 Vocational Rehabilitation
University of Wisconsin-Stout
P.O. Box 790
Menomonie, WI 54751-0790
Phone: 715-232-1126

February 2, 2017

Joshua J. Gamer
Ed. D. CTE
University of Wisconsin-Stout

RE: A Qualitative Look at One-Year Manufacturing Program Students' Perceptions of Manufacturing, Values of Work and Enrollment Decision Factors

Dear Joshua:

The IRB has determined your project, "*A Qualitative Look at One-Year Manufacturing Program Students' Perceptions of Manufacturing, Values of Work and Enrollment Decision Factors*", is **Exempt** from review by the Institutional Review Board for the Protection of Human Subjects. The project is exempt under **Category #2** of the Federal Exempt Guidelines and holds for 5 years. Your project is approved from **February 2, 2017** through **February 1, 2022**. If a renewal is needed, it is to be submitted at least 10 working days before the approvals end date. Should you need to make modifications to your protocol or informed consent forms that do not fall within the exemption categories, you will need to reapply to the IRB for review of your modified study.

Informed Consent: All UW-Stout faculty, staff, and students conducting human subjects' research under an approved "exempt" category are still ethically bound to follow the basic ethical principles of the Belmont Report: 1) respect for persons; 2) beneficence; and 3) justice. These three principles are best reflected in the practice of obtaining informed consent from participants.

If you are doing any research in which you are paying human subjects to participate, a specific payment procedure must be followed. Instructions and form for the payment procedure can be found at <http://www.uwstout.edu/rs/paymentofhumanresearchsubjects.cfm>

If you have questions, please contact the IRB office at 715-232-1126, or buchanane@uwstout.edu, and your question will be directed to the appropriate person. I wish you well in completing your study.

Sincerely,



Elizabeth Buchanan
Interim Director of Office of Research and Sponsored Programs and Human Protections Administrator,
UW-Stout Institutional Review Board for the Protection of Human Subjects in Research (IRB)

CC: Dr. Deb Stanislawski

Appendix J: Western Technical College IRB Approval



IRB Approval

The Western Technical College IRB has reviewed and approved the Waiver of Authorization for use of protected human subject information (HSI) for research purposes for the following project:

Project Title: A Qualitative look at one-year manufacturing program students' perceptions of manufacturing, values of work, and enrollment decision factors.

**Principal Investigator: Joshua J. Gamer, Doctoral Candidate
University of Wisconsin-Stout, WI**

Date of Approval: February 13, 2017

Effective Date: Immediately

Your request for the use or access of HSI has been determined to be necessary for the conduct of the study by the IRB. In approving this Waiver of Authorization, the IRB has made the following determinations:

- The use or disclosure of HSI involves no more than minimal risk.
- Granting of waiver will not adversely affect privacy rights and welfare of the individuals whose information will be used.
- The project could not practicably be conducted without a waiver.
- The project could not practicably be conducted without use of HSI.
- The privacy risks are reasonable relative to the anticipated benefits of research.
- An adequate plan to protect identifiers from improper use and disclosure is included in the IRB request.
- An adequate plan to destroy the identifiers at the earliest opportunity, or justification for retaining identifiers, is included in the IRB request.

In making this determination the IRB has reviewed the following documentation:

- IRB request for Western Technical College
- IRB approval from University of Wisconsin-Stout
- Informed consent form
- Research questionnaire (moderator script).

Please contact me at 608-985-9199 or kemahc@westerntc.edu if you have any questions.

Celestine Kemah
Director of Institutional Research

Signature of the IRB Chair or Designee

02/14/17

Date

Appendix K: Informed Consent
UW-Stout Signed Consent Form
for Research Involving Human Subjects

Consent to Participate In UW-Stout Approved Research

Title: A Qualitative look at one-year manufacturing program students' perceptions of manufacturing, work values, and enrollment decision factors.

Research Sponsor: Debbie Stanislawski
715-232-3195
stanislawskid@uwstout.edu

Investigator:

Joshua J. Gamer
gamerj@westernnc.edu
608-386-4972

Description:

The purpose of this research is to better understand why students select manufacturing as a career choice. In order to understand this, the following three research questions were developed:

1. What perceptions of manufacturing exist among those currently enrolled in a one-year, manufacturing based career program at Western Technical College?
2. What do students currently enrolled in a one-year manufacturing based career program at Western value in a job?
3. Why did students, who are currently enrolled in a one-year, manufacturing based career program at Western select that program?

Wisconsin is projected to face a skilled labor shortage within the manufacturing sector. With manufacturing's direct connection to the fiscal health of the state, this problem is in need of attention. Previous research has looked at work values of students but never in correlation to this specific career cluster. Additionally, no time has been spent evaluating perceptions of this career or why a student selects one program over another within the same career cluster. The significance of this study is that it brings together various pieces of data which may help us understand how to better promote specific manufacturing opportunities to potential students. By focusing on students, like yourself, who did select this career path, we may better understand why others may not have.

The study is framed using a qualitative method which employs the use of four focus groups. The focus groups consist of 6-8 students each, who is currently enrolled in a one year, manufacturing program in the areas of Welding, CNC, and Industrial Electronics Maintenance. You will be

asked your opinions related to the research questions and asked to help organize all responses into themes.

Risks and Benefits:

There is minimal risk associated with participating in this study. The only real risk is that you may feel some discomfort discussing your opinions related to the research questions in the focus group of peers. You may also hear disparaging remarks from other participants regarding this career choice.

This study will provide greater insights into understanding the future employees of these three manufacturing occupations. The dissemination of this work could help inform future employers about the values you hold in a job, negative perceptions they should work to overcome, and allow for better recruitment of future students and employees into manufacturing occupations which will strengthen our businesses and potentially provide greater job stability for you as an employee within the manufacturing sector. Employers who read this study will also hear what manufacturing students value in a job which in turn may affect how they structure future work and what they provide to employees in a work environment.

Time Commitment and Payment:

This study is expected to take 75 minutes. No payment for participation will be made, however water, soda, and snacks will be provided during the study.

Confidentiality:

For reasons of maintaining confidentiality, no names will be included in the final paper and your thoughts will only be identifiable as a member of a specific academic program. The transcript of the audio file will also have any names omitted before inclusion into the paper. This signed, informed consent will not be kept with any of the other documents completed with this project.

Right to Withdraw:

Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. Should you choose to participate and later wish to withdraw from the study, you may discontinue your participation at this time without incurring adverse consequences

IRB Approval:

The following must be included on every informed consent:

This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

Investigator: Joshua J Gamer, 608-386-4972
gamerj@westernnc.edu

Advisor: Debbie Stanislawski, 715-232-3195
stanislawskid@uwstout.edu

IRB Administrator
Elizabeth Buchanan
Office of Research and Sponsored Programs
152 Vocational Rehabilitation Bldg.
UW-Stout
Menomonie, WI 54751
715.232.2477
Buchanane@uwstout.edu

Statement of Consent:

By signing this consent form you agree to participate in the project entitled, ***A Qualitative Case Study utilizing focus groups of students currently enrolled in a one-year post-secondary manufacturing program in Western Wisconsin to identify their perception of manufacturing, what they value in work, and factors which influenced their enrollment decision.***

Signature

Date

Signature of parent or guardian

Date

(If minors are involved)

Appendix L: Data Analysis

All Groups Research Question 1 Perceptions of Manufacturing

Summary of Responses	Thematic Schema	Advanced Schema	Synthesis
<p>IEM GROUP</p> <p>IEM Focus Group</p> <p>Indoors and repetitive. Yup, the same thing every day or every week. There's not a lot of change with what you're doing. Overlooked opportunity, as in like higher than just production jobs. Like supervisor positions, higher paid maintenance positions I guess. Or maybe just managers in general</p> <p>Efficiency, mass production, cheaper labor, lower education, less than a four year degree and automation. The efficiency of the building is really all I was thinking there. And cheaper labor is like a if they can find someone to do it cheaper for like the same job then they'll find someone cheaper and let you go.</p>	<p>IEM GROUP</p> <p>Negative Type of Work</p> <p>Indoors and repetitive the same thing every day or every week.</p> <p>mass production. producing a high number of products at one time. making one product and sending it out the door.</p> <p>long hours stuck inside doing the same thing for 8 hours.</p> <p>moving parts, assembly lines, long hours</p> <p>long hours</p> <p>lowered pay</p>	<p>Negative Type of Work- Mass Production</p> <p>Indoors and repetitive</p> <p>Same thing every day</p> <p>Mass production</p> <p>Inside work</p> <p>Long hours, 12 hours</p> <p>CNC- repetitive, boring. Same thing day after day after day.</p> <p>Tedious work</p> <p>Hard work, working with your hands, Blue collar work is work. Not many people want to do it</p> <p>being a slave to the man. big company don't care about you</p> <p>You're just a number.</p> <p>Negative Type of Work- Mass Production</p>	<p>Student's first thoughts of manufacturing go to mass production, assembly lines, where people put stuff together or made in large factories. This work is seen as repetitious and un-engaging</p> <p>Working indoors is viewed negatively</p> <p>Students see hours as being at least up to 12 hours per day. Sometimes, just the type of work can make it seem long</p> <p>Physical hands-on work, categorized as blue collar work that not many people want to do.</p> <p>Viewed that employers do not care about their employees.</p> <p>The physicality of the work is hard on</p>

<p>I put mass production. Maintenance jobs and skilled workers. Like their producing a high number of products at one time. Not like individual runs of certain things. You know like doing specialized products. It's more just making one product and sending it out the door.</p> <p>I just put like union jobs usually, and dirty.</p> <p>"NAME DELETED" company, "NAME DELETED" their all big factories that are dirty. You're going to get dirty.</p> <p>Union- Most of the big ones are union. "NAME DELETED" company, "NAME DELETED", their all big factories that are dirty. You're going to get dirty</p> <p>I said manufacturing plays a big role in the economy, jobs are in high demand and they pay well. When I was coming out of high school my teachers were like, "welders, they make a lot of money", like you don't have to go</p>	<p style="text-align: center;">Negative Type of Work</p> <p>The same things for 12 hours</p> <p>Work Environment</p> <p>efficiency of the building</p> <p>dirty all big factories that are dirty. You're going to get dirty</p> <p>safety gear, loud noises, Having to listen to the machines run all the time.</p> <p>Dirty, greasy machines The first that came out of my head just working places that manufacturing things. Doesn't seem like it</p>	<p>dad says he has to get in tight spots machines My mom-says it's tough on her hands</p> <p>repetition, hard labor, long days. 10-12hr feels like it drags on.</p> <p>if you're doing the same thing it's going to feel like the hours are double</p> <p>labor intensive, long days, working inside, doing the same thing</p> <p>Hard work nobody else wants to do.</p> <p>having to pick stuff up, moving stuff around.</p> <p>Kind of dirty. Not terrible.</p> <p>Boring, same thing over and over</p> <p>factories, repetition</p> <p>production lines, machines, people putting stuff together. some it might be enjoyable</p> <p>Long days. Factory work seems to drag on. Same thing Assembly line, production,</p>	<p>people. It is people driven instead of technology driven</p> <p>The job design will make it either enjoyable or not. Jobs which allow for learning and expansion of knowledge are viewed positively.</p>
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<p>to school that long to have a good paying job and live carefree-I guess. Good pay is, they pay well for the skill that you provide them. Well roughly \$30/hr. \$20-\$30.</p> <p>I put like safety gear, having to wear that, loud noises and long hours. Having to listen to the machines run all the time. I don't know just being stuck inside doing the same thing for 8 hours.</p> <p>Well I deleted some of mine cause there's like no one else like mine. They're stupid. Well there just stupid ones. I don't know. First thing that popped in my head was robots. I don't know, just the first thing that popped in my head and everyone started I thought they were stupid so I got rid of them.</p> <p>I put lot of moving parts, assembly lines, long hours, and lowered pay. just like mechanical stuff moving around. Well, like more like car manufacturing stuff. I don't know.</p>	<p>sounds like a clean environment.</p> <p>Positive Earning Potential</p> <p>Overlooked opportunity, higher than production jobs. supervisor positions, higher paid maintenance positions</p> <p>jobs are in high demand and they pay well.</p> <p>When I was coming out of high school my teachers were like, "welders, they make a lot of money, \$20-\$30. they pay well for the skill that you provide them</p> <p>medium pay, \$20.</p>	<p>big assembly lines, doing the same job</p> <p>Long hours</p> <p>factories, doing the same thing everyday.</p> <p>Buildings and factories, typical old factory work, people doing the same stuff</p> <p>Something being built</p> <p>Assembly lines doing the same thing</p> <p>it's not really an assembly line. it's repetitive work,</p> <p>not in a bad way cause we run machines out every day so you're doing something new every day.</p> <p>Standard same thing</p> <p>Production, same thing every day. not really much room for learning. I'd rather learn different things than doing the same thing, gaining knowledge</p> <p>Negative Work Environment</p> <p>efficiency of the building</p>	<p>Although modern buildings may be cleaner or efficient,</p>
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<p>Well-I guess it's a positive thing, people working together. Doing their thing.</p> <p>Well yeah that varies I guess, it depends, go to college and stuff get maintenance technician degree or something. If you're a supervisor you'll get higher pay. I'm talking more about the people that work on like the assembly lines and stuff. Lower paying stuff</p> <p>I'd say long hours. Just long hours working in the shop and stuff. And for money I'd say just medium pay and stuff. Probably about \$20. probably the same thing for 12 hours Dirty, greasy, I don't know. I mean manufacturing just automatically, parts are greasy, dirty. You know the machines you know. That's what I think. The first that came out of my head just working places that manufacturing things. Doesn't seem like it sounds like a clean environment.</p>	<p>that varies depends, go to college and get maintenance technician degree. If you're a supervisor you'll get higher pay. I'm talking more about the people that work on like the assembly lines Lower paying</p> <p>Skill Requirements</p> <p>cheaper labor lower education less than a four year degree</p> <p>Maintenance jobs and skilled workers</p> <p>but if you go in with an education and you find a job that isn't dirty that you can actually get better pay, you'll get a little bit higher on the totem pole, it is actually, it could actually be a great career for you</p> <p>you don't have to go to school that long</p>	<p>dirty big factories are dirty. You're going to get dirty</p> <p>safety gear, loud noises, the machines Dirty, greasy machines</p> <p>Doesn't seem like it sounds like a clean environment.</p> <p>Negative Work Environment</p> <p>Low lit, dirty buildings, empty buildings, factories (old school)</p> <p>Large companies</p> <p>Someone standing over your shoulder</p> <p>Good Pay and Jobs</p> <p>Overlooked opportunity, higher than production jobs. supervisor positions, higher paid maintenance positions</p> <p>jobs are in high demand and they pay well.</p> <p>\$20-\$30.</p>	<p>manufacturing of the past paints a picture of dirty, low-lit, greasy environments where safety is a concern, it's loud from all of the mechanical equipment,, and the person will get dirty.</p> <p>Manufacturing can provide good pay through jobs beyond general labor.</p> <p>Maintenance jobs, which are in high demand and pay well</p> <p>Students expect between \$20-30 per hour</p> <p>Education is seen as being a way to earn more, to earn higher positions. Those on the assemble line are still low pay.</p>
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<p>I'd say negative. Negative Cause I was kind of trying to think of the negative parts. Like I wasn't really thinking of the group. Well yeah cause that's we were doing. WHY? I think maybe it's other people out there, their influences on you. Like you know you've chose this career but you hear from everybody else out there in the real world tell you that oh that's not a good job or it's greasy/dirty there. You do a lot of repetitive stuff. Well maybe that will start to play in their reasoning why.</p> <p>Well I believe that it actually is pretty dirty if you don't know what you're doing or if you go in without an education, but if you go in with an education and you find a job that isn't dirty that you can actually get better pay, you'll get a little bit higher on the totem pole, it is actually, it could actually be a great career for you.</p>	<p style="text-align: center;">Negative Mgt Relations</p> <p>if they can find someone to do it cheaper they'll find someone cheaper and let you go.</p> <p style="text-align: center;">Outside Influence</p> <p>I deleted some of mine cause there's like no one else like mine. They're stupid. Well there just stupid ones. I don't know. First thing that popped in my head was robots. I don't know, just the first thing that popped in my head and everyone started I thought they were stupid so I got rid of them.</p> <p style="text-align: center;">Outside Influences</p> <p>I was trying to think of the negative parts.</p>	<p>they pay well for the skill that you provide them</p> <p>medium pay, \$20.</p> <p>that varies depends, go to college and get maintenance technician degree. If you're a supervisor you'll get higher pay. I'm talking more about the people that work on like the assembly lines Lower paying</p> <p>Steady pay you can rely upon, insurance</p> <p>Regular hours, scheduling, benefits, good wages</p> <p>Steady pay, insurance, the ability to plan for the future. Steady pay and overtime</p> <p>Steady pay and better pay</p> <p>Benefits, depending, it can be good then it falls through</p> <p>nice to have extra cash, not being able to have time down to reenergize yourself, that's bad, forced work</p>	<p>The jobs provide for a steady income and benefits which allows a person to support their family.</p> <p>Overtime is nice in order to earn more money but forced overtime can be viewed negatively.</p> <p>You are able to advance within a company</p>
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<p>I think on the stereotypes from the past too. Cause you know 50 years ago that manufacturing was known as like a dirty job and low skilled people working there but over time I think like, where we are today, like where technology is getting a lot cleaner and now we have like standards in the workplace it's gotten a lot better since.</p> <p>I mean for me it's like, stuff like this I don't mind grease, I don't mind the dirt. That why more of a hands on stuff like that dirty, the self-motivation. Pacing yourself. I know if I don't like the grease and the dirt, I won't get into this kind of program. I don't mind the grease and dirt and all that stuff, palm of your hands and blisters and all that stuff. I wouldn't get into this but I probably I actually enjoy it, working with your hands and your brain a little bit. So that's my theory. It's better than sitting in a cubicle. You get</p>	<p>I wasn't really thinking of the group. that's we were doing, right?</p> <p>I think it's other people out there, their influences on you. you know you've chose this career but everybody else out there tell you that oh that's not a good job or it's greasy/dirty there. You do a lot of repetitive stuff.</p> <p>Past Paradigms</p> <p>I think on the stereotypes from the past too. 50 years ago manufacturing was known as a dirty job and low skilled people working there but over time, where we are today, technology is getting a lot cleaner and now we have like standards in the workplace a lot better</p> <p>IEM is not Mfg.</p>	<p>Decent pay</p> <p>Room to advance</p> <p>Benefits</p> <p>40 hour a week job</p> <p>steady pay and benefits</p> <p>Skill Requirements</p> <p>cheaper labor lower education less than a four year degree</p> <p>Maintenance jobs and skilled workers</p> <p>with an education you find a job that isn't dirty, get better pay, higher on the totem pole could be a great career</p> <p>don't have to go to school that long</p> <p>places I've worked have had a large unskilled workforce</p> <p>Negative Mgmt. Relations</p> <p>if they can find someone cheaper they'll let you go.</p> <p>supervisors hounding you, yelling at you. Pushing too hard, that's a safety hazard</p>	<p>Short term CTE credentials can lead to better jobs and a great career such as in maintenance. Without that, you have lower pay.</p> <p>The majority of places have many lower skill positions</p> <p>A strong feeling of not being values and</p>
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<p>to move around. Cause I'm more like a physical guy then a just actually sitting there all day long. I'd go nuts.</p> <p>Advanced Mfg. vs. Mfg. I wouldn't of thought it as manufacturing otherwise I wouldn't be doing it. Manufacturing, I think, is more of the people that are doing those jobs we described early, repetitive long hours, doing the same thing. Our jobs are probably going to be more spread out and doing different things and We're not the production workers, we're the maintenance end of it. If you say that to me that means you're talking more integrative, like robotics are doing the work you have guys that are have 2,3,4 years degrees that are designing stuff. It's more like an engineering type. Automation type.</p> <p>Group Identified Themes</p>	<p>I wouldn't of thought it as manufacturing otherwise I wouldn't be doing it.</p> <p>Manufacturing, is more of the people that are doing those jobs we described early, repetitive long hours, doing the same thing.</p> <p>Our jobs are more spread out and doing different things and We're not the production workers, we're the maintenance end of it.</p> <p>Views of Advanced Mfg.</p> <p>to me that means you're talking more integrative, robotics, guys that have 2,3,4 years degrees are designing stuff.</p> <p>It's more engineering, automation</p> <p>Group Identified Themes Repetition, long hours, low and high pay</p>	<p>Piece rate. They made work that promotes people to cut corners.</p> <p>He knew better and got rid of all the other engineers, 450 people laid off.</p> <p>some manufacturers will let you know 10min ahead of your shift that you have to come in 4hrs early the day after There's less of them that do that</p> <p>You're just a number, I didn't feel valued, past being someone's who is warm blooded and can do the job at hand.</p> <p>Dad says people there are just feeling hopeless feeling not appreciated</p> <p>to some you are just a number, they'll replace you.</p> <p>Positive Type of Work</p> <p>if you like what you're making you're going to take pride in your work.</p>	<p>of employers cutting costs through wages.</p> <p>The push for higher production results in low morale and safety concerns. Piece rate in particular is viewed negatively.</p> <p>Management coming in doesn't listen to employees and jobs are cut.</p> <p>Changing schedules for employees last minute is harmful to image.</p> <p>Employees do not feel valued and are telling their kids this which may deter them from entering the field. There is a feeling of a lack of loyalty to employees.</p>
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<p>Repetition, long hours, low and high pay</p> <p>CNC Focus Group</p> <p>Hard work, working with your hands, and blue collar work. Breaking a sweat, having to lift things. Working with your hands, I mean, you're either turning dials or actually picking up parts and tightening bolts, turning wrenches. Blue collar work is just generalized manufacturing work. Not many people want to do it so</p> <p>The first think I thought about was being a slave to the man. I'd say it's like, he works in a small shop and I worked for a big company for a long time and other companies and they want you to do whatever and they don't care about your body a lot of times, especially when you're young. You're just a number. For example, one of my first welding jobs, I was out replacing a guy that fell off scaffolding and they send me out</p>	<p>CNC Focus Group</p> <p>Type of Work Group Identified Themes</p> <p>Repetition, long hours, low and high pay</p> <p>Negative Type of Work</p> <p>repetitive, boring. Same thing day after day after day.</p> <p>Tedious work</p> <p>Hard work, working with your hands, and blue collar work. Breaking a sweat, having to lift things. Working with your hands, you're turning dials or actually picking up parts and tightening bolts, turning wrenches. Blue collar work is just generalized manufacturing work. Not many people want to do it</p> <p>being a slave to the man. big company and other companies they want you to do whatever and they</p>	<p>Repetitive, I don't think that would be a problem.</p> <p>Pride in your work</p> <p>Positive Type of Work</p> <p>different jobs you can do not everybody does the same job</p> <p>Safe due to safety standards</p> <p>Fabrication making different things everyday</p> <p>Construction work, working outside, making stuff with your hands.</p> <p>CNC Only- Unions are Viewed Positively</p> <p>Decent wages, tolerable working conditions when union representation is involved the only place where I really wasn't risking my life.</p> <p>Only so much they can do within the guidelines of OSHA, that's protected more in a union</p>	<p>Repetition is OK if you like what you are doing/creating and can take pride in it.</p> <p>When variety is available it is better</p> <p>OSHA has made the environment better</p> <p>Hands on activities are enjoyed</p> <p>Welding students in particular value being outside</p> <p>Unions are thought to bring higher wages and better working conditions.</p>
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<p>there and said either you go or its your job. So it's basically like do what we say or you don't have a job. That's kind of what I think of as being a slave to the man.</p> <p>But you know that's manufacturing, but I like when I look at smaller shops and stuff are a little bit different. I guess when I think manufacturing I'm thinking big global companies that have shareholders out in New York that don't care about Wisconsin people.</p> <p>Yep a lot of times there's, cause they interact with you every day. A lot of times the owner is right next to you working. And you know they only have 3 or 4 guys so they can't afford to have someone get hurt. Whereas if you have 50-60 guys or even more.</p> <p>Decent wages, tolerable working conditions, some occasions usually when union representation is</p>	<p>don't care about your body, especially when you're young.</p> <p>You're just a number. do what we say or you don't have a job. that's manufacturing</p> <p>Positive Type of Work</p> <p>if you like what you're making you're going to take pride in your work.</p> <p>Repetitive, I don't think that would be a problem.</p>	<p>pay is usually going to be livable in a union shop.</p> <p>experiences with different employers the effort I've put in, things I've seen. I was pretty active in the union, talked to people all over America, Canada, Mexico seeing just how manufacturing actually is in North America. My viewpoints aren't just in the area we are in</p> <p>Smaller Companies are Viewed More Favorably in all Groups</p> <p>Smaller shops, they interact with you, the owner is right next to you working. they can't afford to have someone get hurt</p> <p>there's more than one type of manufacturing: where you do a lot of repetition, but some smaller ones you might not be doing all the repetition. constantly doing something different,</p> <p>people get burned out doing the same thing</p>	<p>Unions provide a safer work environment</p> <p>A unions message is strong and influences beyond the walls of the company</p> <p>The CNC trade appears to be more favorable of unions</p> <p>Seeing the owners is important With fewer employees, they feel more appreciated</p>
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<p>involved. So, that's kind of the only place where I really wasn't risking my life or whatever. There was another place I worked where you're welding on a forklift, just on a pallet that's lifted up in the air 25ft it's like when I was 20yrs old, I wasn't scared of height or anything but looking back on it you get in to a place and look at all the safety rules and everything and it's like yeah that was stupid. So as far as working conditions and decent wages you know. There's a lot of places that pay decent wages, but then there's the union representation that you get, you know it goes along with your health benefits and everything. But even then it isn't always that but the work conditions is the biggest thing, there's only so much they can do within the guild lines of OSHA cause obviously that's all protected a lot more in a union shop than that so.</p> <p>Working condition it's you know</p>	<p>Pride in your work</p> <p>Smaller Shops Care More</p> <p>Smaller shops are different, they interact with you every day, the owner is right next to you working. They only have 3 or 4 guys so they can't afford to have someone get hurt</p> <p>big global companies that have shareholders don't care about Wisconsin people.</p> <p>Negative Mgmt. Relations</p> <p>supervisors hounding you to get something done then they come back and you don't</p>	<p>big factory, if they want longevity for their employees next week you can go do something else</p> <p>manufacturing needs to bring more liveliness into manufacturing</p> <p>large factory, you're just a trigger puller. If you're in a small setting you're actually a welder and a fabricator.</p> <p>smaller business room to learn because people can be a little more flexible. But when you're on massive scale you become a number instead of a person. do the same thing every day.</p> <p>Note from researcher- I'm noticing a lot of head bobbing going on. As you said that and a fist bump</p> <p>large employer just one job day in and day out. all you're going to do is weld. in a smaller shop you might be doing basic mechanics</p> <p>get rid of the guy that's been here</p>	<p>Smaller businesses are viewed as providing more variety for employees</p> <p>There is a desire to cross train and do different things to keep the job interesting</p> <p>Small businesses are more flexible because they need to be</p> <p>The ability to learn more leads to the feeling of job security</p>
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<p>supervisors hounding you, like behind you every second, or they tell you to get something done by noon and then they come back in at 11:30am and you don't have it completely done and they start yelling at you and it's like well you said noon. Pushing a guy too hard to get too much stuff, that's a safety hazard cause things are moving, lot of equipment going every place. We got one guy, you know you mentioned When they're base off of piece rate and if one part of the line goes down everyone stops getting paid. And they have that ease where there was like 900 work related injuries in a 1000 day period. And that's as simple as you know ok this broke down, ok it take 3 minutes to change the blade. He starts up the machine, they're not done ehanging the blade yet and he gets his finger cut off. You know that's the stuff that happens in that working conditions and that's where safety can play</p>	<p>have it completely done and they start yelling at you. Pushing a guy too hard to get too much stuff, that's a safety hazard cause things are moving, lot of equipment going every place.</p> <p>Piece rate and if one part of the line goes down everyone stops getting paid. This broke down, take 3 minutes to change the blade. He starts up the machine, they're not done and he gets his finger cut off. That's the stuff that happens in that working conditions and that's where safety can play a big aspect in that work. They made work that promotes people to cut corners.</p>	<p>longer just because he wants more pay.</p> <p>switch off</p> <p>more variety is better</p> <p>knowledge is better than anything else more skills you have the more likely people are going to want to keep you or put you on more jobs.</p> <p>make yourself valuable</p> <p>Welding, IEM, and CNC are Not Mfg.</p> <p>I wouldn't of thought it as manufacturing otherwise I wouldn't be doing it.</p> <p>Manufacturing, is more of the people that are, repetitive long hours, doing the same thing.</p> <p>Our jobs are doing different things and We're not the production workers, we're the maintenance end of it.</p>	<p>Calling these programs manufacturing deters interest.</p>
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<p>a big aspect in that work. They made the work that lifestyle in work that promotes people to cut corners. All it takes is one smart idiot to ruin things. We had a big engineer come. We've had engineers that have worked there for 40yrs and had everything running like a fine oiled machine. And we had one engineer that came in, said he knew better and got rid of all the other engineers and you know and now they have 450 people laid off. "Name deleted" experienced that too. So has "Name Deleted." That's all I got.</p> <p>Just repetitive, and boring. Same thing day after day after day. Tedious work, that's my thoughts.</p> <p>Steady pay, insurance and the ability to plan for the future. Most manufacturing work is at least 40hrs a week so you're able to plan off of that and have your steady pay. Then there's typically over time.</p>	<p>He knew better and got rid of all the other engineers and you know and now they have 450 people laid off.</p> <p style="text-align: center;">Negative Mgmt. Relations</p> <p>There are some manufacturers that will let you know 10min ahead of your shift that you have to come in 4hrs early the day after There's less of them that do that you know but it does happen</p> <p style="text-align: center;">Positive Earnings Potential</p> <p>Steady pay you can rely upon, insurance</p>	<p>Sitting at a break press</p> <p>cutting of material as it goes</p> <p>Car factories. assembly work</p> <p>assembly line</p> <p>assembling things or making things</p> <p>When you just think manufacturing it is assembling little parts</p> <p>Definitely something else.</p> <p>Could be used in manufacturing</p> <p>welding structures, buildings like this</p> <p>Trade</p> <p>more of a skilled trade. Not everyone can do it.</p> <p>manufacturing welding, pulling people off the street to do what they want them to do.</p> <p>When I think about people coming here learning all aspects of it I think of a company that wants you to know how to</p>	<p>The term manufacturing deters interest</p> <p>Manufacturing is repetitive, long hours</p> <p>IEM is a support part of manufacturing</p> <p>No skill required</p> <p>Low skill assembly line work</p> <p>CNCV is higher skill than assembling parts</p> <p>Doesn't describe the field</p> <p>A part of manufacturing</p> <p>Welding is creating</p>
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<p>It's nice to have the extra cash, but getting every weekend, not being able to have time down to reenergize yourself, that's bad. I worked at "Name Deleted" for a while and we were able to be forced to work 13 continuous days in a row.</p> <p>Steady pay so it's a good income. You can rely upon it at least. A reliable income. Insurance which is awesome. Mainly because you have to have it now or you get fined.</p> <p>Regular hours, and scheduling, good benefits, good wages and then pride in your job and what you're making.</p> <p>Which they have that in manufacturing but you're generally just working one. This way your bouncing you know one day your 1st shift, the next day you're 2nd, a couple of days in a row you could be 3rd. So a nice regular schedule is the same every week with the days off.</p>	<p>Regular hours and scheduling, benefits, good wages</p> <p>Steady pay, insurance, and the ability to plan for the future. Steady pay and overtime</p> <p>Steady pay and better pay</p> <p>Benefits, depending on where you work, it can be good then it falls through</p> <p>It's nice to have the extra cash but not being able to have time down to reenergize yourself, that's bad forced to work 13 continuous days</p>	<p>do more than one thing wants you to be adaptable and kind of work outside the box a bit more</p> <p>There is welding at manufacturing jobs that's just kind of doing the same thing over and over</p> <p>it can be manufacturing</p> <p>Fabrication would be better.</p> <p>don't consider structural building buildings or-pipeline as manufacturing.</p> <p>welding for manufacturing is something insignificant</p> <p>manufacturing welding you do without the degree</p> <p>manufacturing, its all machine made. You're guy running the machine</p> <p>the robot do it for you, you just make sure it does it. you just sit there.</p> <p>manufacturing I think of mass productions by machines</p>	<p>Higher skill</p> <p>Manufacturing is lower skill for a specific repetitive task</p> <p>Graduates of a CTE program are adaptable and have a wider skill set and are able to do a wider variety of tasks</p> <p>They call it something different</p> <p>Welding for manufacturing is insignificant, doesn't require a degree, and the machine does all of the work.</p> <p>Your job is to watch the machine.</p> <p>Advanced manufacturing is</p>
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<p>Even if it does tend to get repetitive because of the nature of what I'm making- I don't think that that would be a problem.</p> <p>Benefits. Depending on where you work and your expectation. It can be good or you think it's good and then down the road it falls through.</p> <p>I would say the regular hours just depending. There are some manufacturers that will let you know 10min ahead of your shift that you have to come in 4hrs early the day after. Things like that.</p> <p>There's less of them that do that you know but it does happen. Everything else, if you like what you're making you're going to take pride in your work.</p> <p>Steady pay and better pay</p> <p>Well the pay is usually going to be livable in a union shop. It's just dependent on is it gainful or are you just getting by.</p>	<p>+ Unions and Working Conditions</p> <p>Decent wages, tolerable working conditions when union representation is involved the only place where I really wasn't risking my life.</p>	<p>Advanced Mfg. is Viewed as Higher Skill</p> <p>more integrative, robotics, guys that have 2,3,4 years degrees are designing stuff.</p> <p>It's more engineering, automation</p> <p>More skilled</p> <p>precision work</p> <p>More custom</p> <p>more robotic</p> <p>more high tech</p> <p>More automatic</p> <p>A lot more skill required</p> <p>Cleaner factory, aviation, could eat off of the floor</p> <p>Paradigms are Strong</p> <p>I deleted some of mine cause there's like no one else like mine. They're stupid. First thing that popped in my head was robots-and everyone started I thought they were</p>	<p>viewed as requiring more education, a higher skill set, utilizes higher technology such as robotics, and is a cleaner environment</p> <p>Sharing a positive view which is different from others is uncomfortable. Peer pressure.</p> <p>Expectation was that they should think of negative items</p>
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<p>Mostly positive or negative? Mostly positive with some differing: My experiences with all the different employers that I've had, the effort I've put in, things I've seen. I was pretty active in the union at "Name Removed" went through labor history courses and everything and talked to people all over America, Canada, talked to people in Mexico seeing just how manufacturing actually is in North America. So I guess my viewpoints aren't just in the area we went in so.</p> <p>Advanced Mfg. vs. Mfg. It goes to break press. Sitting at a break press. Just cutting of material as it goes. Car factories. Yeah assembly work Yeah assembly line I thought of this program as more of a manufacturing support or repair.</p> <p>Um most the places I've ever worked were the tool and dye guy and machine, tool guys worked</p>	<p>Only so much they can do within the guidelines of OSHA, that's protected more in a union</p> <p>+ Unions and Pay</p> <p>pay is usually going to be livable in a union shop.</p> <p>experiences with different employers the effort I've put in, things I've seen. I was pretty active in the union, talked to people all over America, Canada, Mexico seeing just how manufacturing actually is in North America. My viewpoints aren't just in the area we are in</p>	<p>stupid so I got rid of them.</p> <p>I was trying to think of the negative parts. that's we were doing, right?</p> <p>other people out there, influences you. you've chose this career but everybody tell you that's not a good job it's greasy/dirty repetitive stuff.</p>	<p>Pressure exists from others to not go into manufacturing.</p>
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<p>directly involved in the manufacturing process but they'd provide the dye for the presses, provide the fixtures and the jigs for the welding, so kind of more of a manufacturing support.</p> <p>I was with the thinking as far as assembling things, or making things not supporting so much but that's the first thought I always have.</p> <p>When you just think manufacturing it is assembling little parts</p> <p>advanced manufacturing. Probably more skilled precision work More one off parts More custom I'd say more robotic</p> <p>Group Identified Themes</p> <p>Good pay and benefits Not mfg.</p>	<p>CNC is not Mfg.</p> <p>Sitting at a break press</p> <p>Just cutting of material as it goes</p> <p>Car factories. Yeah assembly work</p> <p>Yeah assembly line</p> <p>assembling things or making things</p> <p>When you just think manufacturing it is assembling little parts</p> <p>Views of Advanced Mfg.</p> <p>More skilled</p> <p>precision work</p> <p>More one off parts More custom</p>		
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<p>WELDING GROUP B</p> <p>I put labor intensive, long days, working inside, and doing the same thing every day. Like just always having to pick stuff up, moving stuff around. Hard work I guess, and just stuff that nobody else wants to do. My dad says he has to get in some pretty tight spots to fix the machines he's working on and my mom just says it's tough on her hands. But they're older so, I guess that kind of comes with it.</p> <p>I put repetition, hard labor, and long days. I'm kind of thinking it's like 10-12hr shifts but at the same time it's like it could be like an 8hr shift</p>	<p>more robotic</p> <p>Group Identified Themes</p> <p>Good pay and benefits <i>Not mfg.</i></p> <p>WELDING GROUP B</p> <p>Negative Type of Work</p> <p>My dad says he has to get in some pretty tight spots to fix the machines</p> <p>My mom just says it's tough on her hands</p> <p>repetition, hard labor, long days. 10-12hr shifts but it could be an 8 hr. shift but it feels like it drags on.</p> <p>I don't think there's a lot of repetition but if you're doing the same thing over and over it's going to feel like the hours are double</p>		
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<p>but it kind of feels like it drags on. Yeah like with the repetition. I mean, I don't think there's a whole lot of repetition but again if you're doing the same thing over and over it's going to feel like the hours are 2 hours so.</p> <p>I wrote down like construction work, working outside, and making stuff with your hands. I also wrote working in factories, doing repetition and stuff. Production lines, machines, people putting stuff together. It depends on what part you're doing some of it might be enjoyable, other parts not as much. Kind of dirty. Not terrible.</p> <p>I had written down boring. Lots of same thing over and over again. A lot of the places I've worked have or had a very large unskilled workforce. I think most of the people on the floor hadn't had any education past high school. The last one I had, you're just a number. Lot of</p>	<p style="text-align: center;">Negative Type of Work</p> <p>labor intensive, long days, working inside, doing the same thing every day.</p> <p>Hard work and stuff nobody else wants to do.</p> <p>having to pick stuff up, moving stuff around.</p> <p>Kind of dirty. Not terrible.</p> <p>Boring, same thing over and over.</p> <p>Working in factories, repetition</p> <p>production lines, machines, people putting stuff together. depends on what you're doing some it might be enjoyable, other not as much.</p> <p style="text-align: center;">Negative Mgmt. Relations</p>		
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<p>places I worked at, I didn't feel valued very much at all, past being someone's who is warm blooded and can do the job at hand.</p> <p>My dad works at a manufacturing plant and he always says all the people there are just kind of like feeling hopeless kind of, feeling not really appreciated for like the work that they do. That's what he said.</p> <p>GROUP THEMES Repetition and long days</p> <p>So, do you consider welding as manufacturing or do you view it as something else?</p> <p>Definitely something else.</p> <p>Yeah It could be used in manufacturing.</p> <p>I think of welding, like welding structures, like buildings like this.</p> <p>More of a trade.</p>	<p>You're just a number, I didn't feel valued, past being someone's who is warm blooded and can do the job at hand.</p> <p>Dad works at a manufacturing plant says people there are just feeling hopeless feeling not appreciated for the work that they do</p> <p>Skill Requirement</p> <p>places I've worked have or had a very large unskilled workforce</p> <p>Hands On</p> <p>Construction work, working outside, making stuff with your hands.</p>		
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<p>Definitely more of a skilled trade. Not everyone can do it.</p> <p>Ok, so what if I asked the question advanced manufacturing? Would I have had the same answer as you gave me here with advanced manufacturing or would you have said something different? If you say something different what you describe advance manufacturing as?</p> <p>It sounds more high tech kind of. More automatic A lot more skill required. I also tend to think of like a cleaner type factory, for instance aviation, I'd think of as more of an advance type manufacturing, and you could pretty much eat of the floor in most of the places I've been to that make airplanes.</p> <p>There is welding at like manufacturing jobs that's just kind of doing the same thing over and over again you know. The</p>	<p>Welding is Not Mfg.</p> <p>Definitely something else.</p> <p>Could be used in manufacturing</p> <p>I think of welding, welding structures, buildings like this</p> <p>Trade</p> <p>more of a skilled trade. Not everyone can do it.</p> <p>manufacturing welding job I think of pulling people off the street and teaching them how to do what they want them to do. Just that specific weld and they do the same thing every day, just constantly.</p> <p>When I think about people coming here learning all aspects of it I think of a company that wants you to know how to do more than one thing wants you to be adaptable and kind of work outside the box a bit more</p>		
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<p>same parts that you're working with. I don't know. It could be its own category</p> <p>I guess as manufacturing with welding job I think of a couple different companies where their really pulling people off the street and teaching them how to do what they want them to do. Just that specific weld and they do the same thing every day, just constantly. Whereas when I think about people coming here learning all aspects of it I think of a company that wants you to know how to do more than one thing and wants you to be adaptable and kind of work outside the box a bit more.</p> <p>WELDING GROUP A</p> <p>Long days from my experience factory work seems to drag on a bit. Decent pay and factory work.</p>	<p>There is welding at manufacturing jobs that's just kind of doing the same thing over and over</p> <p>Views of Advanced Mfg.</p> <p>more high tech</p> <p>More automatic</p> <p>A lot more skill required</p> <p>Cleaner factory, aviation, could eat off of the floor</p> <p>GROUP THEMES Repetition, long days</p> <p>WELDING GROUP A</p> <p>Negative Type of Work</p> <p>Long days. Factory work seems to drag</p>		
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<p>Room to advance a lot of factories you can go from a manufacturing person to foreman</p> <p>Benefits</p> <p>Standard same type of thing over and over. Set standard to each product</p> <p>big building if you don't have the room to build stuff its kind of hard to do that</p> <p>OSHA's rules always keeping within their standards</p> <p>Quality checks always having someone standing over your shoulder making sure everything checks out</p> <p>Equipment, a variety of equipment laying around</p> <p>Look at manufacturing as more safe due to the safety standards</p> <p>Assembly line</p> <p>Basically anytime I think of production I think of like big assembly lines, like cars, and one person doing the same job over and over and over.</p> <p>Large companies</p> <p>Repetitive process</p> <p>Low lit dirty buildings big huge</p>	<p>on. Same thing over and over.</p> <p>Assembly line, production,</p> <p>big assembly lines, doing the same job over and over</p> <p>Long hours</p> <p>factories, doing the same thing everyday.</p> <p>Buildings and factories, typical old factory work, people doing the same kind of stuff over and over again</p> <p>Something being built</p> <p>Assembly line in lines doing the same thing over and over</p> <p>Negative Type of Work</p> <p>when I say assembly line, it's not really an assembly line. But it's repetitive work, not in a bad way cause we run</p>		
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<p>empty dirty buildings, factories, like old school factories Long hours</p> <p>Fabrication making different things everyday Factories same person does the same thing everyday</p> <p>Buildings and factories, typical old factory work, people doing the same kind of stuff over and over again pressure vessels</p> <p>something being built when I think of manufacturing think of something always being built, put together. Something like that assembly line-people in lines doing the same things over and over everyday</p> <p>Well I work in a fab shop now. We have welders and machinists. I run one machine there. We make race car parts. So when I say assembly line, it's not really an assembly line. But it's kind of like repetitive work. Like not in a bad way cause we run</p>	<p>machines out every day so you're doing something new every day.</p> <p>Standard same thing over and over</p> <p>Production, doing the same thing every day. not really much room for learning. I'd rather learn day to day different things than doing the same thing over and over again without gaining any more knowledge.</p> <p>Positive Type of Work</p>		
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<p>machines out every day so you're doing something new every day. I guess we got like deadlines we have to meet. Otherwise the person buying the parts isn't going to be happy having to wait weeks for their parts.</p> <p>product, getting towards like the same thing over and over again different parts to build something for a different company different jobs you can do not everybody does the same job day in and day out. There might be times when you switch or room to grow and stuff like that.</p> <p>A 40 hour a week job with steady pay and benefits. Usually you start out in a factory they'll start you out small but yet there's always like it's not salary. You can go to factories that give salary but then like probably "Name Removed" it's a weekly pay. And with the 40 hrs a week you're working 8hrs a day Monday through Friday. Its</p>	<p>different jobs you can do not everybody does the same job</p> <p>Negative Work Environment</p> <p>Low lit, dirty buildings, empty buildings,</p> <p>factories (old school)</p> <p>Large companies</p> <p>Someone standing over your shoulder</p> <p>Positive Work Environment</p> <p>Safe due to safety standards</p> <p>Fabrication making different things everyday</p> <p>Negative Mgmt. Relations</p>		
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<p>just a steady job with steady pay</p> <p>I think there's more than one type of manufacturing. Yes there is a lot of ones where you do a lot of repetition, but there are some smaller ones you might not be doing all the repetition. You might be doing different stuff in one day. That's kind of how are shop is. We're smaller. We ship parts throughout the world, but there's like 17 of us that work there. So like you're constantly doing something different, but it's still manufacturing. So like you can have a factory over here where you're doing the same thing every day for like 40 yrs. Or else there can be like manufacturing where you're doing something different every day. You know that's actually kind of the problem with manufacturing today. You got these people that get burned out after 20 years because they're doing the same thing every day. I mean these big</p>	<p>to some you are just a number they'll replace you.</p> <p>Positive Earning Potential</p> <p>Decent pay</p> <p>Room to advance</p> <p>Benefits</p> <p>40 hour a week job</p> <p>steady pay and benefits</p> <p>Smaller Companies are Viewed Better</p> <p>there's more than one type of manufacturing: Yes there is a lot of ones where you do a lot of repetition, but there</p>		
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<p>factory owners, if they want longevity for their employees they should seriously think about doing like instead of like ok like set up a schedule like you're going to do this this week and next week you can go do something else. Cause like what I've always heard of like "Name Removed" its same thing every day for those people and they get burned out quick so. Basically what I'm trying to say is that manufacturing needs to bring more liveliness into manufacturing which I guarantee would speed up production and have better results with what they're trying to make and the products they're trying to sell.</p> <p>When I think of production I think of doing the same thing every day. There's not really much room for learning. And not much learning being done. Like I'd rather learn day to day different things than doing the same thing over and over again</p>	<p>are some smaller ones you might not be doing all the repetition. We're smaller so you're constantly doing something different, but it's still manufacturing</p> <p>people get burned out after 20 years because they're doing the same thing every day</p> <p>big factory owners, if they want longevity for their employees should up a schedule you're going to do this this week and next week you can go do something else</p>		
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<p>without gaining any more knowledge. I think it depends on the size of the business too. Like a smaller business I feel like you got that room to learn because like people can be a little more flexible. But when you're on like a massive scale you like become a number instead of a person. So you just go do the same thing every day.</p> <p>Note from researcher- I'm noticing a lot of head bobbing going on. As you said that and a fist bump obviously. You have to make yourself valuable because to some companies you are just a number. They'll just replace you. Huge companies, they'll go for whoever like oh you can do the same thing he can but he wants more money because he's been here longer. We're going to get rid of the guy that's been here longer just because he wants more pay. I think knowledge is better than anything else because the more skills you have the</p>	<p>manufacturing needs to bring more liveliness into manufacturing</p> <p>Smaller Companies are Viewed Better</p> <p>in a factory, a large scale factory, you're just a trigger puller. If you're in a small setting you're actually a welder and a fabricator.</p>		
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<p>more likely people are going to want to keep you or put you on more jobs.</p> <p>Well or let say yeah like I said before, switch it up for your employees cause like let's say this guy got sick one day well nobody knows how to run his stuff because he's the only one doing it. If you have somebody that comes and that they switch off ok I know how to do his job and I can go do that one today. And then you can have somebody fill your spot and that alone can keep up the need and demand that you need to keep up with.</p> <p>I was just thinking like the same thing. If you get more people to know what all is going on you canmore variety is better.</p> <p>With the large employer you might just be doing one job day in and day out. Let's say you're just a welder. That's all you're going to do is weld. If you're in a smaller shop you might be doing basic mechanics, that kind of stuff.</p>	<p>smaller business I feel like you got room to learn because people can be a little more flexible. But when you're on massive scale you like become a number instead of a person. So you just go do the same thing every day.</p> <p>Note from researcher- I'm noticing a lot of head bobbing going on. As you said that and a fist bump</p> <p>large employer you might just one job day in and day out. say you're a welder. That's all you're going to do is weld. If you're in a smaller shop you might be doing basic mechanics, that kind of stuff.</p>		
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<p>Like in a factory, like he just said, large scale factory, you're just a trigger puller. If you're in a small setting like "Name Deleted" is where there's just 17 guys there you're actually being a welder and a fabricator. That's kind of why I chose this program to come here and not go to a big factory and sit and pull a trigger all day. I actually wanted to build stuff and making my own way and be like hey I built that bridge and hey I built that pillar hey I went over there and I built that building. And actually put thought in your project and not just toe the line.</p> <p>Themes identified by group: Repetition, same stuff everyday, Assembly lines, Factory, Mass production</p> <p>View welding as Mfg.?</p> <p>No No</p>	<p>We're going to get rid of the guy that's been here longer just because he wants more pay.</p> <p>have somebody that comes and switch off I know how to do his job and I can go do that one today. And you can have somebody fill your spot</p> <p>more variety is better.</p> <p>Job Security</p> <p>knowledge is better than anything else more skills you have the more likely</p>		
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<p>I think it can be but I don't think it should be lumped into it. Fabrication Fabrication would be better. I don't really consider structural building buildings or even pipeline as manufacturing. Most of the welding that I think you do for manufacturing is like one little bead or something else insignificant like that. I think most of the manufacturing welding you do without the degree. I think that with the degree you open your like you're able to go more places and do more types of welding. Basically when you think about manufacturing you think about its all machine made. You're just the guy running the machine to make sure it doesn't break. Sometimes you even get paid in those shops where you sit and watch the welder weld. Like the robot do it for you you just make sure it does it. Set it and then you just sit there.</p>	<p>people are going to want to keep you or put you on more jobs.</p> <p>make yourself valuable</p> <p>Welding is Not Mfg.</p> <p>it can be manufacturing but I don't think it should be lumped into it</p> <p>Fabrication would be better.</p> <p>don't really consider structural building buildings or even pipeline as manufacturing.</p> <p>welding you do for manufacturing is something insignificant</p> <p>most manufacturing welding you do without the degree</p>		
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<p>When I think of manufacturing I think of mass productions by machines. That's why I wouldn't put welding in that category. I don't even want to go into a shop for welding. Id want to travel around. That's what one of my friends does and he just got out of this program.</p>	<p>manufacturing, its all machine made. You're just the guy running the machine</p> <p>the robot do it for you, you just make sure it does it. then-you just sit there.</p> <p>When I think of manufacturing I think of mass productions by machines more types of welding.</p>		
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Appendix M: Aggregated Work Values Ranking

	RANKINGS FROM EACH PARTICIPANT																									Sum	Ranked Priority (via score)	Relative Importance %	Ranked Priority (via %)	Freq. of Voting	Ranked Priority (via freq.)			
	W1	W2	W3	W4	W5	W6	W7	W8	W9	WB1	WB2	WB3	WB4	I1	I2	I3	I4	I5	I6	I7	I8	I9	M1	M2	M3							M4	M5	
	Variety	1		5	3	1	3		4	1		2		2	3		3			4		3			2								2	39
Achievement							2	1				3			2				1				2				11		2.7		6			
Workplace	5	4	1		2	2	5	1			3			2	2	1							4		4	4	1	41	4	10.1	4	15	4	
Coworkers	2	3			4			3	3					1		1			4	2	2		2	2			29		7.2		12			
Supervision				2	3	4	1		2	2	1		4	3					3	4		2		1	3	3	1	4	43	3	10.6	3	17	3
Creativity		1	4								3																8		2.0		3			
Job Security	4	2		4		5	3	4		5	4	4	1		1	3	5		3		4	1	3	4		3	3	66	2	16.3	2	20	2	
Independence			2	1											4							1				1		9		2.2		5		
Prestige							2					1	2					1									6		1.5		4			
Lifestyle											2	5		5		4		2	1	3	3	4		1		2		32		7.9		11		
Mental Challenge												5															5		1.2		1			
Income	3	5	3	5	5	1	4	5	5	4	5	3		4	5	5	4	5	5	5	5	5	5	5	5	5	5	116	1	28.6	1	26	1	

Appendix N: Work Values by Program Area

CNC	Sum	(via score)	Rel. Importance %	(via %)	Frequency	(Via count)
Variety	4	5	5.33	4	2	5
Achievement	2		2.67		1	
Workplace	13	2	17.33	2	4	3
Coworkers	2		2.67		1	
Supervision	12	4	16.00	3	5	1
Creativity	0		0.00		0	
Job Security	13	2	17.33	2	4	3
Independence	1		1.33		1	
Prestige	0		0.00		0	
Lifestyle	3		4.00		2	5
Mental Challenge	0		0.00		0	
Income	25	1	33.33	1	5	1
IEM	Sum	(via score)	Rel. Importance %	(via %)	Frequency	(Via count)
Variety	15	4	11.11	4	5	4
Achievement	3		2.22		2	
Workplace	5		3.70		3	
Coworkers	12	5	8.89	5	6	3
Supervision	12	5	8.89	5	4	
Creativity	0		0.00		0	
Job Security	17	3	12.59	3	6	3
Independence	5		3.70		2	
Prestige	1		0.74		1	
Lifestyle	22	2	16.30	2	7	2
Mental Challenge	0		0.00		0	
Income	43	1	31.85	1	9	1
Welding	Sum	(via score)	Rel. Importance %	(via %)	Frequency	(Via count)
Variety	20	4	10.26	4	8	3
Achievement	6		3.08		3	
Workplace	23	3	11.79	3	8	3
Coworkers	15		7.69		5	
Supervision	19	5	9.74	5	8	3
Creativity	8		4.10		3	
Job Security	36	2	18.46	2	10	2
Independence	3		1.54		2	
Prestige	5		2.56		3	
Lifestyle	7		3.59		2	
Mental Challenge	5		2.56		1	
Income	48	1	24.62	1	12	1