AN ANALYSIS OF THE FACTORS THAT INFLUENCE THE PERCEPTIONS OF THE MANUFACTURING INDUSTRY AMONG HIGH SCHOOL STUDENTS IN MACOMB COUNTY, MICHIGAN

by

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ABSTRACT

The last 20 years have seen the manufacturing industry undergo a dramatic transformation. What was once a monotonous, physically laborious job requiring no post-secondary education is now a career characterized by high technology requiring some level of post-secondary education. The availability of qualified people to work in manufacturing is inadequate, which is partially attributable to an absence of young people pursuing these careers.

This study explored factors that influence manufacturing industry perceptions among high schools students in Macomb County, Michigan. A survey was used to gather the data. Quantitative methods including ANOVA and logistic regression were used to analyze the relationship between several factors and students' perceptions of manufacturing, and the impact of those perceptions on their likelihood of pursuing a career in the industry. Research revealed students who trend toward a negative perception of manufacturing are unlikely to even consider employment in the industry as a career option. Factors negatively influencing students' opinions of manufacturing include perceptions that the work is boring and carries high risk of on-the-job injury. Factors positively influencing students' opinions include perceptions that jobs pay well, use high technology, and present many career advancement opportunities; taking a manufacturing-related class; and being of the male gender.

Stakeholders need to engage in collaborative efforts to affect positive change on young peoples' perceptions of the manufacturing industry. Not doing so contributes to ineffective vocational guidance methods and allows young people to go largely uninformed on career opportunities within this sector. As key cogs of workforce development strategies, community colleges are positioned to prepare the manufacturing workforce and close the skills gap. In their mission to support employers, community colleges can enhance their value by facilitating opportunities for students to experience manufacturing classes through collaboration with high schools and establishing career exploration opportunities and pathways through collaboration with employers.

DEDICATION

This is dedicated to my family, whose encouragement and love was unceasing throughout the entire program. Benjamin, your support and devotion was instrumental to my success in this endeavor. You are my everlasting light and love of my life. Mom, your love, support, and guidance, regardless of my direction, has fueled my ambition and enabled me to go many places throughout my life. For that I am eternally grateful. Dad, you have never wavered in your love and commitment to being proud of me no matter what. I would not be where I am today were it not for my loving and attentive parents. Lisa for being a great sister and helping make life fun. Cora, for being steadfast in your encouragement as I worked through this dissertation. You were always there to listen when I needed to vent and give me advice and hope when I felt like I was losing my way. Shannon, your love and quiet humor gave me the boosts I needed as I encountered bumps along the way. Finally, to Deb, my role model, who shaped my academic endeavors and always knew I could do it even when I did not. Grandma Moxley would be so proud!

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CHAPTER ONE

INTRODUCTION TO THE STUDY

While the United States did not initially emerge as the global leader in manufacturing, once the post-Civil War industrialization process began, it took only a decade for America to surpass Great Britain as the worldwide leader in the manufacturing sector (Schmenner, 2001; Smil, 2013). In 1870, Great Britain was responsible for almost one-third of global manufacturing output while the United States' portion accounted for less than one-quarter. By 1890, however, the United States' output would skyrocket to 36% while Great Britain's portion of production had declined to less than 15% (Smil, 2013). The impetus for this rapid ascent: American advancements in technology (Schmenner, 2001; Smil, 2013). Per Schmenner (2001) "the American system of manufactures was all about standardization of product design and the interchangeability of parts" (p. 92). According to Smil (2013) "these developments made the United States not only the largest mass producer of goods but also the leader in commercializing new inventions, setting up entirely new industries, introducing new ways of production, and raising labor productivity" (Smil, 2013, p. 23).

Manufacturing in Michigan

Michigan was radically impacted by one of the new industries brought about by the manufacturing movement, becoming the birthplace of the automotive industry, an industry that would grow to become the largest in the United States (Fasenfest & Jacobs, 2003). Led by automotive technology pioneers, including Ransom Olds and Henry Ford,

by 1905 Michigan was known as *the* home of the automotive industry, with the City of Detroit as its nucleus (Bentley Historical Library, 2009). The succeeding decades through the 1950s would witness the automotive industry's settling across Michigan, with the highest concentrations in the Southeast region, as the need for additional and larger facilities—for both the automotive companies and the wealth of suppliers they spawned—brought swift economic growth to the surrounding suburban areas in Wayne, Oakland, and Macomb counties (Fasenfest & Jacobs, 2003). According to Fasenfest & Jacobs (2003) "the standard process was to build the plant in a 'semi-rural' area and then construct housing for workers around the facility" (p. 155). The Southeast Michigan region became culturally and economically steeped in manufacturing, making one hard-pressed to meet a family that did not have a least one member employed in the industry.

Manufacturing in Southeast Michigan

More recent years have seen the Southeast Michigan region's economic position falter substantially, a result not only of the Great Recession, but from the impact of events that foreshadowed the recession (Van Noy & Jacobs, 2012). Differing theories abound, but whether it was financial mismanagement; perpetual design and production of inefficient vehicles on scales that were far too grand; the energy crisis; unsustainable labor contracts; legacy costs; or a combination of those and more, the American automotive industry all but collapsed, crippling the region's manufacturing sector. Communities across the Southeast Michigan region were among those to feel the effects most intensely (Van Noy & Jacobs, 2012; Vey & Friedhoff, 2010). Between 1999 and 2009 the region lost 200,000 manufacturing jobs (United States Department of Labor, 2015). According to Vey and Friedhoff (2010) "the global financial crisis, the

bankruptcy of two of the Detroit three, and the overall contraction of the manufacturing sector have wreaked their own unique brand of havoc on communities already struggling to remain competitive in a changing economy" (p. 1).

Current State of Manufacturing Industry in United States

According to Nicholson and Noonan (2014) "the U.S. manufacturing sector has turned a corner. For the first time in over 10 years, output and employment are growing steadily" (p. 3). While output and employment have not recovered to the levels that preceded the Great Recession, there are grounds for optimism (Giffi & DeRocco, 2011; Molnar, 2014; Nager & Atkinson, 2015; Nicholson & Noonan, 2014). Per Nicholson and Noonan (2014) "between February 2010 and May 2014, the sector has added 646,000 jobs, and manufacturers are actively recruiting to fill another 243,000 positions" (p. 3). Indeed, these are encouraging statistics, but the United States should move forward with vigilance and take care to nurture and insulate the post-Great Recession manufacturing industry (Giffi & DeRocco, 2011; Molnar, 2014; Nager & Atkinson, 2015; Nicholson & Noonan, 2014). A major area of concern, from the present into the foreseeable future, is a shortage of human capital.

Skills gap. There is a gap in the United States between the number of people needed to work in the manufacturing industry and the number of people with the requisite skills and knowledge who are available to work in the manufacturing industry (American Society for Training & Development [ASTD], 2012; Balakrishnan, 2014; Berger, 2013; Mourshed et al., 2012; Nicholson & Noonan, 2014; Woolsey & Coxen, 2013). Compounding this issue is a lack of people with the desire or willingness to pursue careers in the industry (Michigan Department of Technology, Management and Budget

[MDTMB], 2013; Woolsey & Coxen, 2013). In Southeast Michigan, a significant hub of manufacturing in the United States, this issue is ever apparent (Michigan Workforce Development Agency [MWDA], 2014; MDTMB, 2013). According to Walsh (2012) "Rising automotive sales and wages in low-cost countries mean one thing: increased manufacturing in Southeast Michigan. Tool and die makers and machine shops are busy again, but that growth comes with a cost, and it's spelled 'Help Wanted'" (para. 1). Over recent years, people lost faith in the industry, seeking alternate careers or leaving the state, and parents warned children a career reliant on manufacturing had a bleak future at best. According to Knight (2008) parents and teachers have a gross misperception filled with "visions of manual labor and old assembly lines of the past; the threat of layoffs and outsourcing; a lack of exposure to the benefits of manufacturing innovation; and a general misunderstanding of what today's modern manufacturing jobs entail" (para. 4).

It is clear manufacturing is plagued by an image problem. The United States faces the difficult challenge of changing this image problem that continues to afflict the manufacturing industry; however, perception is a much tougher thing to change than one might think. According to the Fabricators & Manufacturers Association, International (2009) "combating this image and shining a spotlight on the career opportunities in manufacturing now represent missions of more and more organizations, whether these are grassroots or national efforts" (para. 11). Sirkin, Zinser, and Rose (2013) further assert "companies, schools, governments, and nonprofit agencies must collaborate to expand the training and recruitment of the next generation of manufacturing talent and to build public awareness of the attractiveness of skilled manufacturing professions" (p. 11).

Vocational Guidance Received by Youth in the United States

According to Mekinda (2012) "career development is an ongoing process that begins in childhood and lasts through adolescence and well into adulthood" (p. 52). Studies have shown, however, while this is an ideal process, it is often not the reality (Hurley & Thorp, 2002; Karp, 2013; Mourshed, Farrell, & Barton, 2012; Munro, 2007). As Mourshed et al. (2012) assert, "the journey from education to employment is a complicated one, and it is natural that there will be different routes. But too many young people are getting lost along the way" (p. 13). The career guidance young people receive outside of their homes is nearly non-existent and that which they do receive from their parents is marginal at best. As such, students remain largely uninformed on career opportunities, frequently picking career paths based on their likes and dislikes rather than what is available, profitable, and projected to have a future (Hurley & Thorp, 2002; Karp, 2013; Mourshed et al., 2012; Munro, 2007). Per Munro (2007) what is "perhaps even more unfortunate is the fact that some will possess little knowledge of their interests, abilities, and values and how these impact their enjoyment and sense of fulfillment in their work" (p. 6).

Workforce Development for Manufacturing

Employee education and training were not traditionally a high level area of focus for manufacturers. Indeed, quite the opposite was true. According to Fasenfest and Jacobs (2003) "they were looking for . . . poorly educated individuals who were willing to follow orders and leave their brains at the plant gate entrance" (p. 156). Into the late 1970s, most workers were minimally educated, receiving targeted on-the-job training to learn only specific job duties (Brecher, 1974; Fasenfest & Jacobs, 2003). According to

Fasenfest and Jacobs (2003) "about 10% of the hourly workforce received a more systematic education and training through the skilled trades agreements adopted in the union-management-initiated system" (p. 156). Due to the rapid expansion of the manufacturing industry and its ascent to a position of great prominence within the American economy, matters that had the greatest impact on efficiency and profitability were given the most attention by management, leaving the education of workers largely unattended to (Fasenfest & Jacobs, 2003).

By the late 1970s, fueled by the growth of technology and the sophistication of competition, "there was increasing recognition of the need for education and training in the auto industry as part of all efforts" (Fasenfest & Jacobs, 2003, p. 160). It became apparent to manufacturers that skilled workers would now need a considerably larger scope of technical knowledge than what was traditionally requisite (Fasenfest & Jacobs, 2003). Still, the on-the-job training component would not be abandoned; Manufacturers recognized it was a necessary ingredient for a comprehensive skilled trade education (Jacobs, 1986; Marschall, 1990). Per Marschall (1990) "centuries of experience have demonstrated that the process of 'learning by doing' is a highly successful way to absorb job-related skills and knowledge, for it ensures that training is guided by the accumulated expertise possessed by experienced workers" (p. 6); however, according to Nerden (1973) "the technical levels of the necessary mathematics, physics, chemistry, instrumental drafting, and other areas call for instruction of a post-high school nature" (p.45). It would be incumbent upon community colleges to provide this degree of education to the workforce (Cohen & Brawer, 2008; Nerden, 1973).

As Jacobs asserts (2009), "if there is one common mission identified with community colleges, it is workforce education: the ability of these colleges to provide courses and programs that prepare students for work or for advancement within their present jobs" (p. 109). In effect, one of the main drivers that compelled the growth of community colleges was "the need for workers trained to operate the nation's expanding industries" (Cohen & Brawer, 2008, p. 1). Though community colleges have existed since the early 20th century, it was not until the post-World War II economic expansion that career and technical education began to emerge as a central piece of the community college mission, which was previously more transfer-oriented (Jacobs, 2009). The nation realized an impending demand for semiprofessionals, but recognized the country's four-year institutions could not swiftly make the modifications necessary to provide semiskilled education (Cohen & Brawer, 2008). Community colleges were uniquely qualified to fill this niche, or as Nerden (1973) bluntly asserts "such instruction is clearly the responsibility of the community colleges and technical institutes" (p. 45). Organizations began turning to these institutions for access to a knowledgeable population from which they could build their workforce (Berger, 2013; Maradian, 1989).

Studying Factors that Influence Perceptions

The rationale for studying perceptions is grounded in the fundamental principles of marketing, specifically the study of consumer behavior. Consumer behavior takes into account the numerous reasons why, when, where and how people buy things (Tanner, 2010). Cultural and social values as well as personality traits and characteristics have a significant impact on the consumer decision-making process (Mason & Hausler, 2006). Gaining an understanding of consumers' perceptions enables marketers to select the

stimuli and the medium that are most likely to transmit information about products and services in the way that will best capture consumers' attention (Tanner, 2010). According to Bhatnagar (2008) "perceptions have the power to shape future goals and aspirations, and, more importantly, negative perceptions can limit these options and even prevent students from considering technology majors" (p. 121). Ergo, gaining insight on the factors that influence young peoples' perception of careers in the manufacturing industry will provide the community college and employers an understanding of how to better position careers in the industry and the correlating preparatory educational programming in young peoples' minds.

Statement of Problem

The manufacturing industry in Michigan has undergone a dramatic transformation over the last 20 years. Traditionally, a job in manufacturing meant working on the line and required no more than a high school diploma. Today, jobs in manufacturing are careers characterized by high technology and require some level of post-secondary education. Across Michigan, particularly in Southeast Michigan, the need for educated and skilled people to work in manufacturing is growing at a rapid pace, but the availability of such people is scarce (MWDA, 2014; MDTMB, 2013). Community colleges must understand the future workforce's perceptions of the manufacturing industry so they may support employers by facilitating the effective promotion of manufacturing programming and careers.

Purpose of the Study

As will be disclosed in the review of literature, a surplus of information exists on the nature of educational and vocational guidance received by young people. However,

while there is also a hefty body of work on the history and current state of the manufacturing industry, inclusive of issues such as the skills gaps and lack of interest among young people, there is little information that examines *why* young people are not interested in the manufacturing industry. As such, the researcher's primary concerns in carrying out this study are to explore the influences of current manufacturing industry perceptions among high schools students in Macomb County, Michigan, and ascertain the likelihood they will pursue a career in manufacturing. To examine these influences in more depth, the researcher will use a survey of high school students in Macomb County. Southeast Michigan and specifically Macomb County was chosen as the location for the study because it is currently experiencing a shortage of skilled manufacturing workers and constitutes the primary service area for Macomb Community College, the institution at which the researcher is employed.

Nature of the Study

Based on a review of research methods, the researcher determined a quantitative analysis was the most appropriate method for this study. Quantitative research is the process of gathering numerical data and statistically analyzing it to rationalize a specific event or events (Vogt, 2007). According to Mahoney and Goertz (2006) "[using quantitative research] the analyst typically seeks to identify causes that, on average, affect (e.g., increase or decrease) the values on an outcome across a large population" (p. 232). Creswell (2003) further asserts "if the problem is identifying factors that influence an outcome . . . or understanding the best predictors of outcomes, then a quantitative approach is best" (pp. 21-22). The researcher will utilize descriptive statistics and analysis of variance to determine the relationship between several environmental,

economic, vocational, and educational factors and high school students' perceptions of the manufacturing industry, as well as the impact of their perceptions on the likelihood they will pursue a career in the manufacturing industry.

Research Questions

This study examines the following questions:

1. Do high school students' perceptions of the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry?
2. What factors have the most influence on the likelihood high school students will choose a career in the manufacturing industry?
3. What people have the most influence on the likelihood students will choose a career in the manufacturing industry?
4. Do high school students' perceptions of the level of college education needed to gain employment in the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry?
5. Does having a family member who works or previously worked in the manufacturing industry impact the likelihood high school students will choose a career in the manufacturing industry?
6. Does the city, township, or village of residency impact the likelihood high school students will choose a career in the manufacturing industry?
7. Does gender impact the likelihood high school students will choose a career in the manufacturing industry?
8. Does race impact the likelihood high school students will choose a career in the manufacturing industry?

Significance of the Study

Workforce and economic development are key pieces of the community college mission. As an institution of the community, it is a duty of the community college to support and augment the success of local industry. Speaking to the needs of and working in partnership with employers, the college helps ensure the community's workforce is current and prepared for what the future holds. The community college provides customized training infused with the most up-to-date technologies and concepts to solidify this important piece of the mission. This study is important because a lack of public research exists that identifies what younger generations think of the manufacturing industry. By better understanding the perceptions of high school students and what influences those perceptions, the community college can improve upon marketing manufacturing programming and career opportunities to these students. This is a significant step toward rebuilding the pipeline of qualified employees required by the local manufacturing industry. What will be learned through this study should be applicable to all community colleges, but it is especially helpful to Macomb County, as well as comparable regions around the country that focus on manufacturing that are grappling with a similar problem.

Summary

According to Nicholson and Noonan (2014) "the U.S. manufacturing sector has turned a corner. For the first time in over 10 years, output and employment are growing steadily" (p. 3). Threatening to stunt this growth is a gap in the United States between the number of people needed to work in the manufacturing industry and the number of people with the requisite skills and knowledge who are available to work in the

manufacturing industry (American Society for Training & Development [ASTD], 2012; Balakrishnan, 2014; Berger, 2013; Mourshed et al., 2012; Nicholson & Noonan, 2014; Woolsey & Coxen, 2013). Compounding this issue is a lack of people with the desire or willingness to pursue careers in the industry (Michigan Department of Technology, Management and Budget [MDTMB], 2013; Woolsey & Coxen, 2013). Over recent years, people lost faith in the manufacturing industry, seeking alternate careers or leaving the state, and parents warned children a career reliant on manufacturing had a bleak future at best. According to Knight (2008) parents and teachers have a gross misperception filled with "visions of manual labor and old assembly lines of the past; the threat of layoffs and outsourcing; a lack of exposure to the benefits of manufacturing innovation; and a general misunderstanding of what today's modern manufacturing jobs entail" (para. 4).

A surplus of information exists on the nature of educational and vocational guidance received by young people. It reveals students remain largely uninformed about career opportunities, frequently picking career paths based on their likes and dislikes rather than what is available, profitable, and projected to have a future (Hurley & Thorp, 2002; Karp, 2013; Mourshed et al., 2012; Munro, 2007). While there is also a hefty body of work on the history and current state of the manufacturing industry, inclusive of issues such as the skills gaps and lack of interest among young people, there is little information that examines the factors that influence young peoples' perceptions of the manufacturing industry. In light of this absence of information, the researcher's primary concerns in carrying out this study are to explore the influences of current manufacturing industry perceptions among young people. To accomplish this, the researcher utilized a survey of

high school students with the intention that this approach will afford community colleges an understanding of the future workforce's perceptions of the manufacturing industry so they may better support industry by facilitating the effective promotion of manufacturing programming and careers.

CHAPTER TWO

REVIEW OF LITERATURE

The purpose of this study was to explore the influences of current manufacturing industry perceptions among high schools students in Macomb County, Michigan, and ascertain the likelihood they will pursue a career in manufacturing. Several intrinsic and extrinsic factors have the potential to influence high school students' perceptions of manufacturing. Because the current body of literature includes scant data regarding young peoples' perceptions of careers in the manufacturing industry, this chapter offers a unique review of the literature in five areas relevant to this phenomenon:

1. Substantial reports of high unemployment among youth, including those with bachelor's degrees, coupled with the plethora of career opportunities available in manufacturing implores a review of the path young people travel on their way from education to employment. How are young people informed of and exposed to careers that are available and profitable?
2. A review of the history of interaction between the manufacturing industry and community colleges as a primary developer of the industry's workforce is of significance in the scope of this study. The community college has been a reliable industry labor resource in the past. Is this still so?
3. The future implications for the manufacturing industry in the United States are a compelling area of interest that is germane to this study. The problems the

industry is currently experiencing did not develop without warning. What does the manufacturing industry need to be planning for in order to preserve its vital role in the American economy of the future?

4. The future implications for community colleges in support of the manufacturing industry carry substantial weight as well. The community college has a part to play in developing the manufacturing industry workforce of the future. What strategies should community colleges execute to support the development of the manufacturing industry workforce to the fullest extent possible?
5. Finally, a rationale for the examination of the factors that influence perceptions is a reasonable expectation within the context of this study. Why study the factors that influence perceptions? What revelations have emerged from similar studies?

The following review will explore the current body of literature on these five areas of interest as they pertain to this study.

The Path from Education to Employment

According to Mekinda (2012) "career development is an ongoing process that begins in childhood and lasts through adolescence and well into adulthood" (p. 52). Studies have shown, however, while this is an ideal process, it is often not the reality (Hurley & Thorp, 2002; Karp, 2013; Mourshed, Farrell, & Barton, 2012; Munro, 2007). As Mourshed et al. (2012) assert, "the journey from education to employment is a complicated one, and it is natural that there will be different routes. But too many young people are getting lost along the way" (p. 13). The career guidance young people receive outside of their homes is nearly non-existent and that which they do receive from their parents is marginal at best. As such, students remain largely uninformed on career

opportunities, frequently picking career paths based on their likes and dislikes rather than what is available, profitable, and projected to have a future (Hurley & Thorp, 2002; Karp, 2013; Millward, Houston, Brown, & Barrett, 2006; Mourshed et al., 2012; Munro, 2007). Per Munro (2007) what is "perhaps even more unfortunate is the fact that some will possess little knowledge of their interests, abilities, and values and how these impact their enjoyment and sense of fulfillment in their work" (p. 6).

Origin of Vocational Guidance

The practice of vocational guidance, more commonly referred to today as career counseling, began to take form in the United States in the late 1890s. Unemployment, fostered by the industrial revolution, a growth in urbanization, and the return of World War I veterans are among the factors that led to its foundation (Herr, 2013; Pope, 2000). Social reformer Frank Parsons was the first to offer a logical framework for vocational guidance (Herr, 2013; Pope, 2000). Parson's (1909) three-step model necessitated:

> (1) a clear understanding of yourself, your aptitudes, abilities, interests, ambitions, resources, limitations, and their causes; (2) a knowledge of the requirements and conditions of success, advantages and disadvantages, compensation, opportunities, and prospects in different lines of work; (3) true reasoning on the relations of these two groups of facts. (p. 5)

Parson's model motivated researchers to direct their efforts toward a wider and improved understanding of personal characteristics and assessment methods, professions, and courses of decision-making (Herr, 2013; Pope, 2000). This spurred the creation of "vocational education" courses and programs as well as guidance counselors in high schools across the United States (Herr, 2013).

A Fragmented System

Despite this example of a seemingly logical foundation, there is no universally accepted or official system of vocational guidance for young people that has evolved in the United States. The guidance young people receive is a fragmented mix of some level of exposure to familial careers; advice from parents and other family members; and school-based counseling, often from both counselors and teachers, which may begin in elementary school or middle school, but typically does not begin until the latter years of high school (Hurley & Thorp, 2002; Mourshed, et al., 2012; Munro, 2007). According to Hurley and Thorp (2002) "the nation's career guidance system is falling short" (p. 1). A lack of consistency in both the quantity and quality of career guidance given to young people has perpetuated substantial skills gaps for employers and high levels of unemployment among youth (Mourshed, et al., 2012). Furthermore, Mourshed, et al. (2012) plainly conclude "examples of positive outcomes in education to employment are the exception rather than the rule" (p. 20).

Guidance from the home. A review of existing literature reveals family members, usually one or both parents, have the most influence on young peoples' career interests, but whether parents are proactively giving advice or whether young people are actively seeking it is unclear (Bardick, Bernes, Magnusson, & Witko, 2005; Gibbons, Borders, Wiles, Stephan, & Davis, 2006; Hurley & Thorp, 2002; Mourshed, et al., 2012; Munro, 2007). Overall, Munro (2007) found "it is difficult to determine exactly how much influence the family (specifically parents) has on a student's career choice" (p. 7). Hurley and Thorp (2002) found that 78% of the students they studied cited their parents as the biggest source of career guidance. Conversely, what is more striking is, when

asked how much time they had spent discussing careers with their parents over the past three months, the amounts of time were relatively low. The percentages reported were as follows: 11%, less than an hour; 14%, about an hour; 24%, one to three hours; 30%, more than three hours, 18%, not at all; and 3% were undecided or did not know (Hurley & Thorp, 2002).

According to Levine and Sutherland (2013) "parents' career interests, self-efficacy, values, and abilities . . . have an effect on children's career exploration. Parents act as the primary role model for their children and may encourage or discourage career exploration through modeling, discussion, or providing information" (p. 242). Bardick, et al. (2005) found "parents perceived their roles during career planning to be supportive, informative, and educative [but] they believed that more information and stronger relationships with teachers would help them support the career planning of their children" (p. 152). In that vein, Gibbons, et al. (2006) discovered parents often depended on school counselors and teachers to provide career guidance to their children. According to Gibbons, et al. (2006) "parents reported encouraging their students and having general conversations about future plans, but few seemed to be actively helping their students investigate the world of work or future career . . . possibilities" (p. 175). Three out of four of the young people studied reportedly had a career interest for at least a year, but none of them had pursued or been guided toward any practical exposure to their field of interest. Their "parents seemed unsure of how or whether they could help" (Gibbons, et al., 2006, p. 175). The parents' ineffectiveness providing career guidance is expected given in most cases parents have not been educated to give career guidance and

their knowledge will be limited by their personal experiences (Bardick, et al., 2005; Gibbons, et al., 2006; Levine & Sutherland, 2013; Mourshed, et al., 2012).

Guidance from the school. According to Wei-cheng, Hitchcock, and Calvert (1998) "one of the most important tasks in school counseling is to facilitate students' educational and vocational development" (p. 161). Notwithstanding, while the current body of work suggests parents look to their children's schools to provide career guidance, children studied have indicated they find school counselors to be less than helpful in this area (Gibbons, et al., 2006; Hope Street Group, 2014; Hurley & Thorp, 2002; Levine & Sutherland, 2013). Hurley and Thorp (2002) discovered more than half of the students they studied did not perceive any genuine career guidance taking place in their high schools. Only 10% of students studied reported school personnel had played a significant part in the career guidance they had received (Hurley & Thorp, 2002). Several reasons are cited as sources of this disconnect, mainly: students are not seeking out counselors and/or counselors are not seeking out students; students do not value counselors' opinions; students believe counselors do not understand them; counselors are not adequately prepared to give career counseling; and the population of students at many institutions is too large for the counselors to provide individually focused career guidance (Association for Career and Technical Education [ACTE], 2008; Gibbons, et al., 2006; Hope Street Group; 2014; Hurley & Thorp, 2002; Munro, 2007; Powlette & Young, 1996).

Studies indicate students believe their teachers are slightly more helpful than counselors when it comes to career guidance (Association for Career and Technical Education [ACTE], 2008; Gibbons, et al., 2006; Hurley & Thorp, 2002; Powlette &

Young, 1996). Hurley and Thorp (2002) found "among school employees, teachers edge out counselors as the most likely adult career influence" (p. 2) and Gibbons, et al., (2006) found teachers were rated as "somewhat helpful," which is a marginal improvement over the "least helpful" rating those students gave to counselors. Research suggests this is due to the strength of the student-teacher-relationship over the student-counselor relationship. Students have more frequent communications with teachers than they do with counselors, which points to a stronger relationship and emotional connection (Alexitch, & Page, 1997; Migunde, Agak, & Odiwuor; 2012). Migunde, et al. (2012) concluded "teachers are considered more influential compared to career counselors. This means that, more students seek career advice from the teachers whom they feel comfortable with as compared to career counselors" (p. 235). This raises a concern that, similar to parents, the teachers may not be educated to provide career guidance and such guidance will be limited by the teachers' personal knowledge and experience (Munro, 2007).

A study conducted by Code, Bernes, Gunn, and Bardick (2006) assessed junior high and high school students' perceptions of career concerns and examined how those concerns changed from grades 7 through 12. The results of the study showed students experience a range of concerns about their lives and careers post high school, including having to make a decision and making the wrong occupational choice (Code et al., 2006). Based on the results, Code et al. (2006) "suggest that the introduction of an integrated career planning curriculum beginning at the junior high level may help to address students' unanswered questions and unaddressed career concerns" (p. 173). Moreover, they assert "by involving adolescents' own perceptions of their career concerns, the career-planning process may become more relevant and students may receive better

preparation for the post-high-school transition" (Code, et al., 2006, p. 173). A related study conducted by Pyne, Bernes, Magnusson, and Poulsen (2002) examined how junior high and high school students perceive the terms "career" and "occupation." Pyne et al. (2002) found "the common belief that career paths tend to be permanent, held by many adolescents, could limit their exploration and cause them to avoid decision making, due to a fear of making the wrong choice" (p. 71). Akin to Code et al. (2006), Pyne et al. (2002) recommended starting instruction in career development at the junior high level.

The Manufacturing Industry Workforce and Community Colleges

According to Jacobs (2009), "if there is one common mission identified with community colleges, it is workforce education: the ability of these colleges to provide courses and programs that prepare students for work or for advancement within their present jobs" (p. 109). In effect, one of the main drivers that compelled the growth of community colleges was "the need for workers trained to operate the nation's expanding industries" (Cohen & Brawer, 2008, p. 1). Though community colleges have existed since the early 20th century, it was not until the post-World War II economic expansion that career and technical education began to emerge as a central piece of the community college mission, which was previously more transfer-oriented (Jacobs, 2009). The nation realized an impending demand for semiprofessionals, but recognized the country's four-year institutions could not swiftly make the modifications necessary to provide semiskilled education (Cohen & Brawer, 2008). Community colleges were uniquely qualified to fill this niche, or as Nerden (1973) bluntly asserts "such instruction is clearly the responsibility of the community colleges and technical institutes" (p. 45).

Organizations began turning to these institutions for access to a knowledgeable population from which they could build their workforce (Berger, 2013; Maradian, 1989).

The Value of a Community College Credential

According to Romano (2011) "most of the work done by economists on the economic value of sub-baccalaureate education, as it is sometimes called, concentrates on the benefits going to the students in terms of increased wages or lifetime incomes" (p. 76). The literature on the labor market value, or the value employers place on community college credentials, is scant (Belfield & Bailey, 2011; Dadgar & Weiss, 2012). Much of the research with employers offers insight on the skills they expect credential holders to have, but does not hone in on the skills they require for specific occupations or whether credentials in those occupations lead to a greater chance of employment (Stuart, Rios-Aguilar, & Deil-Amen, 2014; Van Noy & Jacobs, 2012). Some professions, such as those in health care, are regulated and require credentials to gain entry. In other professions, such as those in the manufacturing industry, the value of credentials is completely subject to employer discretion (Stuart, Rios-Aguilar, & Deil-Amen, 2014; Van Noy & Jacobs, 2012). In fact, Dadgar and Weisss (2012) found "that there is great variation in the labor market value of different credential levels, and that there is even greater variation by field of credential" (p. 2). According to Mourshed et al. (2012) "what makes a credential credible is a near universal acceptance within the community it serves" (p. 73).

Credentials in manufacturing. According to Carnevale, Smith, and Strohl (2013) "employers are still willing to pay more for the college degree—a symbol of a worker's attainment of the knowledge, skills, and abilities that improve productivity" (p.

7). Maguire, Starobin, Laanan, and Friedel (2012) found that an associate's degree was the most significant predictor of increased earnings in the manufacturing sector, but employees who did not earn an associate's degree were able to close the earnings gap fairly quickly through on-the-job experience. Maguire, et al. (2012) also discovered students who earned community college certificates in manufacturing areas had increased earnings over students who earned only high school diplomas, but again these increases tapered off or leveled and earnings gaps closed as years of work experience increased. Weaver and Osterman (2014) found:

> Of those [manufacturing] establishments with direct experience of community college applicants, 81 percent reported that they feel the general academic skills of community college applicants for core production positions were either good or very good, and 50 percent felt the same way about job-specific skills. (p. 65)

This indicates these credentials are respected by employers and helpful in measuring the quality of potential employees (Weaver & Osterman, 2014).

These findings not only indicate at least some level of perceived value of community college credentials by employers, they also indicate just possessing the requisite skill sets is enough for people to gain employment in the manufacturing industry. More conclusively, with regard to occupationally specific credentials, Van Noy and Jacobs (2012) found the way employers perceive credentials earned via community college occupational programming is more specifically linked to the local labor market. According to Van Noy and Jacobs (2012) "factors such as the average educational level of local residents, the nature of the industry, and the local community college system may be associated with employers' perceptions of credentials" (p. 26). Also having a role in

employers' perceptions of specific credentials is the overall reputation of the community college and its programs within the local labor market as well as the community as a whole (Van Noy & Jacobs, 2012).

Future Implications for the Manufacturing Industry in the United States

According to Nicholson and Noonan (2014) "the U.S. manufacturing sector has turned a corner. For the first time in over 10 years, output and employment are growing steadily" (p. 3). While output and employment have not recovered to the levels that preceded the Great Recession, there are grounds for optimism (Giffi & DeRocco, 2011; Molnar, 2014; Nager & Atkinson, 2015; Nicholson & Noonan, 2014). Per Nicholson and Noonan (2014) "between February 2010 and May 2014, the sector has added 646,000 jobs, and manufacturers are actively recruiting to fill another 243,000 positions" (p. 3). Indeed, these are encouraging statistics, but the United States should move forward with vigilance and take care to nurture and insulate the post-Great Recession manufacturing industry (Giffi & DeRocco, 2011; Molnar, 2014; Nager & Atkinson, 2015; Nicholson & Noonan, 2014). A major area of concern, from the present into the foreseeable future, is a shortage of human capital. According to Jacobs (2009) "the mismatch between the heightened workforce skill requirements of employers striving to compete in a global economy and the actual skills of employees and those seeking to enter the workforce is a general problem for the U.S. economy" (p. 119).

The Skills Gap

There is a gap in the United States between the number of people needed to work in the manufacturing industry and the number of people with the requisite skills and knowledge who are available to work in the manufacturing industry (American Society

for Training & Development [ASTD], 2012; Balakrishnan, 2014; Berger, 2013; Mourshed et al., 2012; Nicholson & Noonan, 2014; Woolsey & Coxen, 2013). Compounding this issue is a lack of people with the desire or willingness to pursue careers in the industry (Giffi & DeRocco, 2011; Michigan Department of Technology, Management and Budget [MDTMB], 2013; Woolsey & Coxen, 2013). Giffi and DeRocco (2011) found manufacturing ranks second to last as a career choice out of seven major industries in the United States. In Southeast Michigan, a significant hub of manufacturing in the United States, this issue is ever apparent (Michigan Workforce Development Agency [MWDA], 2014; MDTMB, 2013). According to Walsh (2012) "Rising automotive sales and wages in low-cost countries mean one thing: increased manufacturing in Southeast Michigan. Tool and die makers and machine shops are busy again, but that growth comes with a cost, and it's spelled 'Help Wanted'" (para. 1).

Manufacturing's image problem. Over recent years, people lost faith in the manufacturing industry, seeking alternate careers or leaving the state, and parents warned children a career reliant on manufacturing had a bleak future at best. According to Knight (2008) parents and teachers have a gross misperception filled with "visions of manual labor and old assembly lines of the past; the threat of layoffs and outsourcing; a lack of exposure to the benefits of manufacturing innovation; and a general misunderstanding of what today's modern manufacturing jobs entail" (para. 4). The view of manufacturing among young people is troublesome and paints a gloomy picture of the industry's future talent pool (AAR Corp., 2011; Giffi et al., 2015; Giffi & DeRocco, 2011; Hope Street Group, 2014; Knight, 2008; Morrison et al., 2011; Mourshed, et al.,

2012). Giffi and DeRocco (2011) found "among 18-24 year-olds, manufacturing ranks dead last among industries in which they would choose to start their careers" (p. 3).

It is clear manufacturing is plagued by an image problem (AAR Corp., 2011; Giffi & DeRocco, 2011; Hope Street Group, 2014; Knight, 2008; Morrison et al., 2011; Mourshed, et al., 2012). The extent to which this is contributing to the manufacturing skills gap remains unclear (ASTD, 2012; Berger, 2013; Giffi et al., 2015; Giffi & DeRocco, 2011; Morrison et al., 2011; Weaver & Osterman, 2014). According to Berger (2013) the blame is directed at many phenomena: "poor STEM [science, engineering, technology, and math] education in public education; a young generation with bad values and drug habits; employers who don't invest in training; unions that are inflexible and divisive; [and] a bad rap for manufacturing jobs as dirty, dull, and dangerous" (p. 183). Regardless of what the greatest contributors to the skills gap are, the evidence of the image problem afflicting manufacturing careers is ever present. Remedying the image problem is high on the agenda of policymakers, manufacturers, and educators alike. According to the Fabricators & Manufacturers Association, International (2009) "combating this image and shining a spotlight on the career opportunities in manufacturing now represent missions of more and more organizations, whether these are grassroots or national efforts" (para. 11). Sirkin, Zinser, and Rose (2013) further assert "companies, schools, governments, and nonprofit agencies must collaborate to expand the training and recruitment of the next generation of manufacturing talent and to build public awareness of the attractiveness of skilled manufacturing professions" (p. 11).

High technology. The current gap between the number of people needed to work in the manufacturing industry and the number of people with the requisite skills and

knowledge who are available and willing to work in the manufacturing industry can also be attributed to the high technology which now characterizes many manufacturing jobs in the United States. As Giffi et al. (2015) assert "the skills gap problem comes into sharper focus when considering the increasingly technical nature of manufacturing work" (p. 6). Technology advances quickly, transforming manufacturing methods and the skills needed to perform the work at a rate with which the workforce has difficulty keeping pace (American Society for Training & Development [ASTD], 2012; Berger, 2013; Headrick, 2014; Hope Street Group, 2014; HR Policy Association, 2011; Osterman & Weaver, 2014). According to Giffi et al. (2015) "many manufacturers have redesigned and streamlined production lines while increasingly automating processes. While some remaining job roles will require less technically skilled workers, ironically, these trends and innovations actually demand more skilled workers" (p. 6). The HR Policy Association, in their 2011 report *Blueprint for Jobs in the 21st Century,* simply asserts "Americans are not being educated in sufficient numbers to meet the demands of today's highly technical work processes and products" (p. xxviii).

Automation. High technology not only contributes to the skills gap by requiring workers to possess advanced skill sets, it also ups the ante by increasing and developing more sophisticated automated manufacturing processes. Through automation, American manufacturers are able to radically increase production with the aid of considerably fewer workers than they did in previous times (ASTD, 2012; Atkinson, Stewart, Andes, & Ezell, 2012; Ford, 2009; Giffi et al., 2015; Hope Street Group, 2014; Sherk, 2010). Automation not only reduces the number of workers needed to perform lower-skilled operations, it increases the need for workers with advanced skill sets to perform higher-

skilled operations and maintain the automated equipment (Giffi et al., 2015). Accordingly, Ford (2009) asserts "in the future, automation will fall heavily on knowledge workers and in particular on highly paid workers. In cases where technology is not yet sufficient to automate the job, offshoring is likely to be pursued as an interim solution" (p. 73).

Globalization. Globalization also plays some part in the skills gap afflicting the manufacturing industry in the United States today (Atkinson & Mayo, 2010; Ezell & Atkinson, 2011; HR Policy Association, 2011; Katz & Lawrence, 2011; Mourshed et al., 2012; Weaver, 2014). According to the HR Policy Association (2011) "in the new global economy powered by technology and tightly woven together by the Internet, America and American workers are now competing on a world stage" (p. xxi). Globalization has enabled employers to reduce costs by capitalizing on lower labor costs and financial incentives from other countries (Ford, 2009; Smil, 2013). As Gomory (2013) states:

> In this era of globalization, and of worldwide profit seeking, our global corporations are strongly motivated to move their manufacturing abroad, not only in response to the availability of cheap labor, but also in areas of high technology where cheap labor is not the attraction but foreign subsidies are. (para. 5).

The process of offshoring exacerbates the skills gap by moving lower-skilled jobs overseas. In the wake, advanced manufacturing processes like automation are creating more mid-to-high-skilled jobs that require workers to have more sophisticated skill sets, leaving those lower-skilled workers virtually unemployable in America's modern manufacturing industry (Atkinson & Mayo, 2010; Ezell & Atkinson, 2011; HR Policy Association, 2011; Katz & Lawrence, 2011; Weaver, 2014). Theories and opinions on

the extent to which globalization plays a role in the skills gap are diverse, but offshoring remains a reality that impacts American manufacturing now and well into the foreseeable future.

Wage disparity. Low wages, particularly low starting wages, are often cited as a factor that contributes to the skills gap (Atkinson & Mayo, 2010; Berger, 2013; Hope Street Group, 2014; MDTMB, 2013; Osterman & Weaver, 2014; Weaver & Osterman, 2014). According to Weaver and Osterman (2014) "starting wages in local manufacturing establishments are low and fairly stagnant, and this fact…discourages new entrants to the workforce" (p. 60). Low wages or stagnant wages are also a deterrent to qualified workers who may be interested in re-entering the industry. According to MDTMB (2013) "an analysis of several Skilled Trades occupations shows that wages for the Trades have remained relatively flat in recent years. According to data from the Bureau of Labor Statistics, the median wages for Welders and Tool and Die Makers inched lower between 2006 and 2012" (p. 9).

Some contend flat wages are an indication that the skills gap does not exist (Atkinson & Mayo, 2010; Hope Street Group, 2014; MDTMB, 2013; Osterman & Weaver, 2014; Weaver & Osterman, 2014). According to Osterman and Weaver (2014) "simple supply and demand economics implies that when a factor is in short supply, its price will rise" (p. 24). One opposing theory contends that these low wages simply signify employers are using alternative tactics, such as retaining employees past the age of retirement or hiring away talent from competitors, to deal with the skills gap in the short term (Hope Street Group, 2014). Another theory argues that other factors "including lower union membership, changing industry distribution of employment, and

retirements at the senior or advanced level of the pay scale and hiring at the entry or novice-level of the pay scale" (MDTMB, 2013, p. 9) are contributing to this phenomenon. Whatever the actuality may be, low wages are continually cited as one of the top factors that deter people from employment in the manufacturing industry (Hope Street Group, 2014; MDTMB, 2013; Osterman & Weaver, 2014; Weaver & Osterman, 2014). This is a fact industry members and policymakers must address to help ensure the future adequate supply of labor for the manufacturing industry (Hope Street Group, 2014).

Future Implications for Community Colleges in Support of Manufacturing Industry

Increasingly in the current economy, low-to-middle-skill jobs require some level of college education, whether it is a complete credential needed for field entry or taking some classes to attain a certain skill set for field entry. According to Carnevale and Smith (2013) "almost one-third of all job openings between 2010 and 2020 will require a postsecondary vocational certificate, industry-based certificate, some college credits, or an associate degree" (p. 22). This presents a tremendous opportunity for community colleges across the nation to speak to one of the challenges facing the manufacturing industry by providing skills gap solutions unique to the needs of their local constituencies. As Jacobs asserts (2009), "if there is one common mission identified with community colleges, it is workforce education: the ability of these colleges to provide courses and programs that prepare students for work or for advancement within their present jobs" (p. 109). However, there are some roles community colleges need to consider to maximize their effectiveness supporting the manufacturing industry. Among

these are working more intentionally with employers and high schools while maintaining and increasing a strong focus on the student.

Work More Intentionally with Employers

Community colleges across the United States have a long history of working closely with employers. It is ingrained in the community college mission. Nevertheless, the current state of the American manufacturing industry requires community colleges work even closer and form partnerships with employers (AAR Corp., 2011; Melnik, 2014; Weaver, 2014; Weaver & Osterman, 2014; Woolsey & Coxen, 2013). According to Weaver (2014)

> External entities such as community colleges have become more important in the skill-training system as companies try to hire workers who already have the requisite skills. As these educational institutions… become more important, the potential for communication and coordination failures multiplies. (p. 25)

Obviously, it is imperative employers be proactive and reach out to community colleges to better address their specific training needs, and policymakers must work on creating strategies and initiatives that will facilitate and support these deeper relationships (Melnik, 2014; Weaver, 2014; Woolsey & Coxen, 2013). To be optimally effective, the relationship has to be more reciprocal, where community colleges to reach out to the industry to identify their most current needs and develop courses and programs to address them (Bond, 2013; Gonzalez, 2012; Snyder, 2015). Tom Snyder (2015), current President of Ivy Tech Community College in Indiana, asserts "we can no longer rely on the luxury of on-the-job training. Employers expect those they hire are thoroughly

prepared, whether they be an RN or a welder. Community colleges get those employees ready to do their jobs" (para. 12).

Work More Intentionally with High Schools

The career and technical or vocational education programs that were once plentiful in high schools across the United States have diminished over recent years (AAR Corp., 2011; Atkinson & Mayo, 2010; Cappelli, 2014; Hope Street Group, 2014; Houseman, 2014; HR Policy Association, 2011; Steinbrecher, 2009). According to Houseman (2014) "the perception that technology was causing manufacturing jobs to quickly disappear was an important factor spurring major changes in education curricula across the country. Unfortunately, vocational and technical education was often a casualty of these reforms" (p. 10). This has put a dent in the workforce development strategies of many manufacturers, particularly smaller manufacturers, who often recruited students with basic trade-related skills from high school career and technical education programs (Cappelli, 2014). Moreover, the absence of vocational and technical education programs in high schools also deprives students of the opportunity to learn about careers in manufacturing (Atkinson & Mayo, 2010; Giffi, et al., 2015; Hope Street Group, 2014; HR Policy Association, 2011; Steinbrecher, 2009).

Community colleges have to work more closely with local high schools to strengthen and secure the pipeline of qualified people to fill manufacturing jobs. In many cases, the absence of career and technical education programs in American high schools is related to a lack of funding (Pawlowski, 2012; Weaver & Osterman, 2014). Articulation agreements (an agreement whereby the community college and the high school follow a process that provides a pathway for student transfer of credit) and career-

based events or workshops are examples of ways community colleges currently engage high schools. Career-focused dual enrollment models are specifically effective examples of shared-funding efforts community colleges can extend to high schools. Under these models, high school students take community college courses during part of the week and earn college credit in the process (Weaver & Osterman, 2014). Dual enrollment students may graduate from high school with a diploma and a community college certificate of completion, making them ready for entry-level careers. This model not only provides young people with skill sets relevant to the local job market, it increases high school graduation as well as post-secondary enrollment rates (Le & Frankfort, 2011).

A Strong Focus on Students

Community colleges are open-access public institutions enrolling an ethnically diverse combination of low-to-middle income people who vary drastically in college readiness, type and level of work experience, and age (Cohen & Brawer, 2008). The at-risk populations within these institutions are high: According to Wells (2009) "most students enrolling in community colleges have at least one of several risk factors that include delayed postsecondary enrollment, part-time attendance, lack of financial support, having dependents, being a single parent, having no high school diploma, and working full time while being enrolled" (p. 78).

The unique environment that characterizes community colleges presents its own set of distinctive challenges for community college practitioners to address. According to Linderman and Kolenovic (2013) "poor academic preparation, confusion navigating degree pathways and campus culture, and competing demands such as family responsibilities and work are among the many reasons cited for low community college

completion rates" (p. 44). Despite these circumstances, the current federal administration has prescribed bold goals for student success in higher education, calling for the increased completion of college credentials, predominantly associate degrees and career certificates (Belfield, Crosta, & Jenkins, 2013). Which measure of success and completion do community colleges use: Graduating students or getting them jobs (Mullin, 2010)? Mullin (2010) frames the dilemma succinctly:

> Focusing solely on the former narrowly defines success while overlooking the needs and achievements of a significant number of people, whereas focusing solely on the latter will not increase the international ranking of the United States. Community colleges are therefore in the difficult position of balancing two completion agendas: the person's need to return to work and the nation's desire to be a world leader in terms of a narrowly defined set of outcomes. (p. 6)

Community colleges are positioned to ready the workforce to close the skills gap, but they are tasked with doing their part to address the gap within the framework of these seemingly competing agendas. According to Salomon-Fernandez (2014) "the challenge ahead for business and industry, higher education and policymakers is how to raise community college student outcomes in ways that are scalable and sustainable and that address the root cause of the problem" (para. 16). Being student-focused is a key to meeting this challenge. As Linderman and Kolenovic (2013) assert "addressing such issues requires a willingness to critically examine and restructure all aspects of the student experience, from application to graduation, in order to dramatically change the outcome" (p. 44).

The Rationale for Studying the Factors that Influence Perceptions

The rationale for studying the factors that influence perceptions is grounded in the fundamental principles of marketing, specifically the study of consumer behavior. Consumer behavior takes into account the numerous reasons why, when, where and how people buy things. Marketers use many methods, inclusive of surveys, to gather information and study consumer behavior so they may formulate the most effective strategies for marketing products and services to target populations (Tanner, 2010). Cultural and social values as well as personality traits and characteristics have a significant impact on the consumer decision-making process (Mason & Hausler, 2006). According to Mason and Hausler (2006) "consumers are also affected by their perceived roles, which are acquired through social processes" (p. 123). Consumers' roles generate their need for things that will assist them in carrying out these roles, enhance their ability to perform these roles, or support them in attaining their goals (Mason & Hausler, 2006). Gaining an understanding of the factors that influence consumers' perceptions enables marketers to select the stimuli and the medium that are most likely to transmit information about products and services in the way that will best capture consumers' attention (Tanner, 2010).

According to Bhatnagar (2008) "perceptions have the power to shape future goals and aspirations, and, more importantly, negative perceptions can limit these options and even prevent students from considering technology majors" (p. 121). Ergo, gaining insight on the factors that influence young peoples' perception of careers in the manufacturing industry will provide the community college and employers an understanding of how to better position careers in the industry and the correlating

preparatory educational programming in young peoples' minds. While the current body of literature includes scant data regarding young peoples' perceptions of careers in the manufacturing industry, studies on young peoples' perceptions of other career fields that have suffered similar image problems over the years provide some insight on improving a particular career's profile. The following sections review selected studies.

On the Perception of Vocational Education

Spurred by a significant reduction in vocational education enrollment, Haney (2002) studied a single county's high school students' perceptions of such programs. Haney (2002) analyzed the relationship between several student personal factors and their perceptions of vocational education. The findings revealed a low to moderate interest in vocational education among the student population. Haney (2014) also found demographic factors are related to students' perceptions of vocational education, with socio-economic status being the most significant among the factors. He concluded the students did not have a sufficient awareness of the career pathways available to them upon graduation. Based on the results of the study, Haney (2014) asserted "school systems must do a better job of instilling in them the importance of careers and an awareness of the economic impact on the students' future" (p. 102).

On the Perception of Careers in the Marketing Research Industry

Brush et al. (2014) studied a group of university students majoring in psychology and business areas about their perceptions of the marketing research industry. The authors' carried out the study because attracting and retaining quality employees is a significant component of success in the industry. University students in relevant majors, such as those chosen for the study, were the primary source of future personnel. Brush et

al. (2014) found several participants exhibited a lack of understanding of the marketing research profession. Participants perceived marketing careers to consist of surveying populations to gather information and crunch numbers, rather than using insights gathered from research to interpret results and solve problems. Negative stereotypes of the marketing research industry were also a theme present in the study. When the students were given an accurate picture of the industry, however, their views were more positive. Brush et al. (2014) concluded "the industry needs to reposition itself, stressing the conceptual and strategic side of marketing research" (p. 32).

On the Perception of Careers in the Information Systems Industry

Walstrom and Schambach (2012) used a pretest/posttest method to study whether learning more about careers in information systems would impact junior and senior high school students' perceptions of the field. A concern over a confirmed shortage of graduates to fill jobs in the information systems field initiated the study. Previous studies identified a lack of awareness regarding the field as a prominent reason why young people do not choose it as a career (Walstrom & Schamback, 2012). Walstrom and Schambach (2012) sought "to determine if reading an article about the work of a requirements analyst would positively impact the perceptions of student respondents about careers in Information Systems" (p. 235). According to Walstrom and Schambach (2012) "perceptions regarding careers in IS were collected before and after students read Karl Wiegers' article "So You Want to be a Requirements Analyst?" (p. 235). Walstrom and Schambach (2012) found "that merely the opportunity to learn about common elements of the requirements analyst role was sufficient to significantly, positively impact most students perceptions regarding IT" (p. 244-245). Walstrom and Schambach's

(2012) recommendations based on the study include developing students' understanding and awareness of these jobs by exposing them to the knowledge and skills utilized by information systems professionals within their academic program.

On the Perceptions of Careers in the Retailing Industry

A 2009 study performed by the University of Florida [UF] examined students' perceptions of careers in retailing and factors that influence whether they will pursue a career in the field. Previous studies indicated challenges recruiting talent due to negative stereotypes that are associated with retail jobs (UF, 2009). The UF (2009) study found perceptions of retailing careers among students had improved, but "retailers need to keep working on disproving negative retail career images such as dull, boring, and mundane" (p. 3). Factors that positively impacted perceptions of careers in retailing included on-campus exposure to employers in the field as well as information sessions featuring professionals in the field. Career advancement was found to be the career expectation students valued most (UF, 2009). UF (2009) also found "having a retail internship made students develop interest in pursuing a retail career and choose a retail career over sales and banking careers" (p. 3). Based on the results of the study, UF (2009) recommended that employers engage in internship programs to attract talent and offer their employees educational support to nurture and provide opportunities for career advancement.

Summary

After many years of declining production, downsizing, and offshoring, the American manufacturing industry appears to be making a comeback. A major area of concern poised to slow this comeback is a shortage of human capital, which is characterized by an alarming lack of young people with an interest in manufacturing,

making manpower a high profile issue for the industry now and well into the foreseeable future. The manufacturing industry has a history of being well-served by community colleges and their graduates. This presents a tremendous opportunity for community colleges across the nation to speak to one of the challenges facing the manufacturing industry by providing skills gap solutions unique to the needs of their local constituencies.

The human capital issue is being compounded by other issues, including negative stereotyping of careers in manufacturing and a general misconception of modern manufacturing careers among young people. The fragmented system of vocational guidance, consisting of parents and other family members, teachers, and guidance counselors is a growing concern. This system leaves young people largely uninformed on current career opportunities, frequently picking career paths based on their likes and dislikes rather than what is available, profitable, and projected to have a future.

Gaining insight on the factors that influence young peoples' perception of careers in the manufacturing industry will provide the community college and employers an understanding of how to better position careers in the industry and the correlating preparatory educational programming in young peoples' minds. While the current body of literature includes scant data regarding young peoples' perceptions of careers in the manufacturing industry, studies on young peoples' perceptions of other career fields that have suffered similar image problems over the years provide some insight on improving a particular career's profile.

CHAPTER THREE

METHODOLOGY

This chapter describes the quantitative research methods used for this study and the rationale for their use. The data were evaluated using descriptive statistics and analysis of variances to determine whether there is a relationship between the factors that influence high school students' perceptions of the manufacturing industry and the likelihood they will pursue a career in the manufacturing industry. Additionally, the analysis determines which factors have the greatest influence and if there is a difference in perception of the industry among different populations within the participants.

This study analyzed the following questions:

1. Do high school students' perceptions of the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry?
2. What factors have the most influence on the likelihood high school students will choose a career in the manufacturing industry?
3. What people have the most influence on the likelihood students will choose a career in the manufacturing industry?
4. Do high school students' perceptions of the level of college education needed to gain employment in the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry?

5. Does having a family member who works or previously worked in the manufacturing industry impact the likelihood high school students will choose a career in the manufacturing industry?
6. Does the city, township, or village of residency impact the likelihood high school students will choose a career in the manufacturing industry?
7. Does gender impact the likelihood high school students will choose a career in the manufacturing industry?
8. Does race impact the likelihood high school students will choose a career in the manufacturing industry?

Methods Used

A quantitative research method was used for this study. Quantitative research is the process of gathering numerical data and statistically analyzing it to rationalize a specific event or events (Vogt, 2007). According to Mahoney and Goertz (2006) "[using quantitative research] the analyst typically seeks to identify causes that, on average, affect (e.g., increase or decrease) the values on an outcome across a large population" (p. 232). Creswell (2003) further asserts "if the problem is identifying factors that influence an outcome . . . or understanding the best predictors of outcomes, then a quantitative approach is best" (pp. 21-22). The researcher will utilize descriptive statistics and analysis of variance to determine the relationship between several environmental, economic, vocational, and educational factors and high school students' perceptions of the manufacturing industry, as well as the impact of their perceptions on the likelihood they will pursue a career in the manufacturing industry, making the use of quantitative research methods the most logical approach.

Institutional Review Board Approval

In accordance with Ferris State University (FSU) policy, the researcher obtained approval from the FSU Institutional Review Board (IRB) as well as the Chief Academic Officer of the Macomb Intermediate School District (MISD) before conducting any research for this study. The IRB application included information pertinent to the study, including the subject population, subject recruitment, disclosure of any prior association with the subjects, the research procedures and data collection methods, benefits of conducting the research, potential risks to the subjects, privacy assurances and consent procedures.

Population and Sample

The sampling method used for this study is a form of nonprobability sampling known as convenience sampling. Convenience sampling is a statistical method of gathering representative data by choosing participants because they are easily accessible (Vogt, 2007). Students attending a high school located in Macomb County, Michigan, were the target population for this study. According to Vogt (2007) "nationally representative samples are often less detailed than more local ones. In other terms, the choice is sometimes between local depth and national breadth" (p. 83). Local depth is appropriate for this study; when considering external validity, this is an important distinction to make.

High schools in the 21 public school districts in Macomb County, Michigan, which includes 28 high schools and seven alternative high schools, were invited to participate. One public school academy operating at the high school level was also invited. For purposes of this study, the public school academy will be referred to as a

district, making a total of 22 districts comprised of 36 high schools that were invited to participate in this study.

Obtaining parental consent was a necessary step in carrying out this study, as the great majority of high school students are under the age of 18. A passive consent, commonly referred to as an "opt-out" consent, whereby consent is granted by not returning the consent form, was used (see Appendix A for a copy of the parental consent form).

Participant Selection

The researcher began soliciting participation in the study by contacting the Chief Academic Officer (CAO) of the MISD via email on November 4, 2013. The CAO responded on November 12, 2013, indicating all the superintendents in the county were amenable to considering participation in the study. The CAO stated that the optimal time to distribute the survey would be during the fall term, which fit well into the researcher's study plan and gave ample time to design the survey instrument and gain IRB approval for its use in the study. The researcher sent the survey and parental consent form to the CAO for approval on September 8, 2014. She responded with approval on the same date and indicated once IRB approval was attained, she would arrange for the researcher to present the study to the MISD Macomb Association of Curriculum Administrators (MACA) during their monthly meeting. The FSU IRB approved the survey on September 15, 2014. On the same date, the CAO arranged for the researcher to present at the MACA meeting on October 15, 2014.

On October 15, 2014, the researcher presented the study to approximately 60 people at the MACA meeting. Representatives from 17 districts were in attendance.

After the presentation, each district was furnished with a packet of information including an overview of the study (see Appendix B), a copy of the survey indicating it could be administered electronically or in paper format (see Appendix C), instructions to be read to students prior to survey administration (see Appendix D), and a copy of the parental consent form. It was understood the researcher would follow up with each of them in approximately one week to determine which would participate in the study. The CAO gave the researcher a list of email addresses for the principal contact for each district that was present at the MACA meeting.

On October 26, 2014, the researcher sent a follow-up email (see Appendix E) requesting confirmation of participation in the study to the representatives of the 17 districts who attended the MACA meeting. (Note that this email as well as all subsequent follow-up emails and email invitations had PDF files of the overview of the study, the survey, instructions to be read to students prior to survey administration, and the parental consent form attached.) On October 29, 2014, one district's representative emailed back to say it would not participate. From the period beginning October 26, 2014, and ending on November 4, 2014, five representatives emailed back requesting the researcher follow-up directly with the principals of the high schools in those districts. From the period beginning October 29, 2014, and ending on November 9, 2014, the researcher sent email invitations (see Appendix F) to the principals of the ten high schools in those districts. The remaining 11 districts that had representatives in attendance at the MACA meeting did not respond to the follow-up email. To address these districts, the researcher utilized the Macomb County Schools Directory published online by the MISD to gather email address for the principals of the 16 high schools in those districts. On November

10, 2014, the researcher sent an email invitation (see Appendix G) directly to the principals of those high schools.

To address the five districts that were not in attendance at the MACA meeting, on advice from the CAO, the researcher utilized the Macomb County Schools Directory published online by the MISD to gather email addresses for the principals of the high schools in those districts. On October 27, 2014, the researcher sent an email invitation (see Appendix H) to participate in the study to the principals of the six high schools in those districts.

From the period beginning October 27, 2014, and ending November 18, 2014, principals of 11 high schools responded to their email invitation agreeing to participate in the study and two responded indicating they would not participate in the study. On November 17, the researcher sent a final follow-up email (see Appendix I) to the principals of the 19 high schools that had still not responded to their email invitation. None of the 19 principals responded to the final follow-up email. On November 24, 2014, the researcher sent those principals a packet including a paper invitation to participate in the survey (see Appendix J), 25 copies of the survey, 5 copies of instructions to be read to students prior to survey administration, 25 copies of the parental consent form, and a self-addressed pre-paid envelope to return the surveys to the researcher via the United States Postal Service. On December 8, 2014, the researcher sent a brief follow-up email (see Appendix K) to those 19 principals, referring to the mailing and requesting their high school's participation in the study. Ten of those principals responded acknowledging receipt of the packet and agreeing to participate in the study. The remaining nine principals never responded.

Data Collection Instrument

The researcher designed a survey instrument to collect the responses to a series of questions based on current literature and her field experience. The instrument consisted of 30 Likert scale, open-ended, and demographic questions. Content validity and face validity were used to assess the validity of the instrument. Content validity is a method by which subject matter experts are asked to rate the validity of a test or survey (Markus & Smith, 2010; Nevo, 1985). Two experts from Macomb Community College as well as two experts from the local manufacturing industry were asked to analyze the instrument and assess whether the questions reflect the knowledge required for the subject matter. Feedback from the experts was used to adjust five questions to more purposely measure factors that influence perceptions of certain aspects of the modern manufacturing environment and to modify the survey introduction for participant comprehensibility. Subsequently, the researcher utilized a pilot study to test the survey instrument for face validity, a method by which people are asked to evaluate the validity of a test or survey as it is seen by them (Nevo, 1985). The survey took from five to seven minutes to complete. Feedback from the pilot group was used to adjust the wording on two questions to make them clearer to the target population.

In order to accommodate the survey delivery needs of each high school, both an electronic and a paper version of the survey instrument were developed. The researcher provided the paper version of the survey to a member of the Macomb Community College Institutional Research staff, who developed the electronic version using Qualtrics Online Survey Software and Insight Platform. Of the high schools that accepted the invitation to participate in the study, the principals or their designee determined which

classes of students would be administered the survey and whether the paper or electronic version was best to use. The teacher for each class selected administered the survey.

Participants' rights are an important consideration in research involving human subjects. The researcher has a moral and legal obligation to ensure subjects have a thorough understanding of the study and any risks they may be exposed to as a result of their participation (Vogt, 2007). To this end, informed consent was included with both versions of the survey. Informed consent was included in the introduction and purpose of study that the teachers read aloud in class to participants prior to survey administration. Additionally, in the paper version of the survey instrument, informed consent was included in the language participants read before proceeding to question number one. In the electronic version, informed consent was provided in the first question. If consent was not given, participants were unable to proceed with the survey. Both versions of the survey were made available beginning on October 31, 2014. Participants' responses were collected through January 16, 2015.

Variables

Variables that change in response to an external influence are known as dependent variables (Vogt, 2007). Conversely, variables that are manipulated to cause change in dependent variables are known as independent variables (Vogt, 2007). According to Vogt (2007), "an independent variable can sometimes be thought of as a *cause* and a dependent variable as an *effect*" (p. 41). Table 1 lists and categorizes the variables used in this study.

Table 1. *Variables Used in Study*

QUESTION	DEPENDENT VARIABLE	INDEPENDENT VARIABLE
1	Likelihood of choosing career in industry (Survey question no. 11)	Perceptions of Industry Index [PMII] score (Variable calculated from survey question nos. 1-10)

QUESTION	DEPENDENT VARIABLE	INDEPENDENT VARIABLE
2	Likelihood of choosing career in industry (Survey question no. 11)	Factors influencing perceptions of industry (Survey question nos. 1-10)
		Taking a manufacturing-related class (Survey question no. 13)
		Impact of participants' most influential person (Survey question no. 24)
		PMII score (Variable calculated from survey question nos. 1-10)
		Gender (Survey question no. 29)
		People influencing perceptions of industry (Survey question nos. 18-21)
3	Likelihood of choosing career in industry (Survey question no. 11)	People influencing perceptions of industry (Survey question nos. 18-22)
4	Likelihood of choosing career in industry (Survey question no. 11)	Perceptions of level of college education needed (Survey question no. 12)
5	Likelihood of choosing career in industry (Survey question no. 11)	Having family members who work or previously worked in industry (Survey question nos. 14-17)
6	Likelihood of choosing career in industry (Survey question no. 11)	City, township, or village of residency (Survey question no. 25)
7	Likelihood of choosing career in industry (Survey question no. 11)	Gender (Survey question no. 29)
8	Likelihood of choosing career in industry (Survey question no. 11)	Race (Survey question no. 30)

Data Analysis

All data used in this study were collected through the paper and electronic versions of the survey instrument. The survey questions were primarily closed-ended, limiting responses by providing participants with a list of answers to choose from. The majority of the questions utilized a six-point Likert scale, where participants selected their answers from a set of answers ranging from "strongly agree" to "strongly disagree" or from "not at all" to "a lot." The data collected from the electronic surveys was imported into Qualtrics for statistical analysis and coded by assigning a number for each

answer choice (i.e., “strongly agree” = 1, “agree” = 2, “somewhat agree” = 3, “somewhat disagree” = 4, “disagree” = 5, and “strongly disagree” = 6.). Scales on some questions were reversed to prevent acquiescence bias. The data collected from the paper surveys were imported into Qualtrics in accordance with the coding set up for the electronic version. All data were inspected for errors and cleaned if necessary.

The data were evaluated using descriptive statistics and analysis of variance to determine whether there is a relationship between the factors that influence high school students’ perceptions of the manufacturing industry and the likelihood they will pursue a career in the manufacturing industry. The researcher designed the Perceptions of Industry Index [PMII] to determine whether high schools students’ perceptions of the manufacturing industry are negative or positive. The PMII was calculated by adding the responses to survey questions 1 through 10 from each participant. Survey questions 1 through 10 measure the following factors influencing perceptions of the manufacturing industry: (1) physically demanding work; (2) compensation; (3) uninteresting work; (4) high technology used in work; (5) cleanliness of workplace; (6) safety of workplace; (7) lighting of workplace; (8) career advancement; (9) gender diversity of workforce; and (10) repetitive work. High scores indicate a positive perception of the manufacturing industry. Analyses also determined which of these factors have the most influence on high school students’ perceptions of the manufacturing industry as well as whether there is a difference in perceptions among sub groups within the population (i.e., residency, gender, and race).

Question 1, *“Do high school students’ perceptions of the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry?”* was

analyzed using a one-way ANOVA to determine if there is a statistically significant relationship between students' PMII and the likelihood they will choose a career in the manufacturing industry. The eta statistic was used to measure the strength of the relationship. Tukey's HSD test was used post-hoc to determine which groups within the sample differed most significantly. The variables are listed in Table 2.

Table 2. *Research Question One Variables*

DEPENDENT VARIABLE	INDEPENDENT VARIABLE
Likelihood of choosing career in industry	PMII

Question 2, *"What factors have the most influence on the likelihood high school students will choose a career in the manufacturing industry?"* was analyzed using multiple statistical methods. The variables are listed in Table 3. The methods used were as follows:

1. Somers'd and Gamma were applied to measure the individual association between each PMII statement and the likelihood of students choosing career in the manufacturing industry.
2. A one-way ANOVA was used to measure the association between whether students have taken a manufacturing-related class and the likelihood of them choosing a career in the manufacturing industry. The Welch and Brown-Forsythe statistics were used to verify the findings from the ANOVA.
3. The contingency coefficient and eta statistics were used to analyze the strength of the relationship between the impact of the person students perceive to be the most influential on their opinion of the manufacturing industry and the likelihood they will choose a career in the manufacturing industry.

4. Logistic regression was used to examine the effect of all variables simultaneously, accounting for the impact of each predictor variable, while the other predictor variables were controlled for. Only variables found to have a statistically significant association with the likelihood of students choosing a career in the manufacturing industry were included in the logistic regression analysis.

Table 3. *Research Question Two Variables*

DEPENDENT VARIABLE	INDEPENDENT VARIABLE
Likelihood of choosing career in industry	PMII factors influencing perceptions of industry
	Physically demanding work
	Compensation
	Uninteresting work
	High technology used in work
	Cleanliness of workplace
	Safety of workplace
	Lighting of workplace
	Career advancement
	Gender diversity of workforce
	Repetitive work
	Taking a manufacturing-related class
	Impact of participants' most influential person
	PMII score
	Gender
	People influencing perceptions of industry
	Friends
	Immediate family
	Extended family
	Teachers

Question 3, *"What people have the most influence on the likelihood students will choose a career in the manufacturing industry?"* was analyzed using a one-way ANOVA to determine whether specific groups of people have an impact on the likelihood students will choose a career in the manufacturing industry. The Welch and Brown-Forsythe statistics were used to verify the findings from the ANOVA. Somers'd and Gamma were applied to measure the strength of the association between the influence of each group of people and the likelihood of students choosing career in the manufacturing industry. The variables are listed in Table 4.

Table 4. *Research Question Three Variables*

DEPENDENT VARIABLE	INDEPENDENT VARIABLE
Likelihood of choosing career in industry	People influencing perceptions of industry
	Friends
	Immediate family
	Extended family
	Teachers
	Other school staff members

Question 4, *"Do high school students' perceptions of the level of college education needed to gain employment in the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry?"* was examined using a one-way ANOVA to determine if there is a statistically significant relationship between the likelihood students will choose a career in the manufacturing industry and their perception of the level of college education to work in the industry. The contingency coefficient and Gamma statistics were used to measure the strength of the relationship. The variables are listed in Table 5.

Table 5. *Research Question Four Variables*

DEPENDENT VARIABLE	INDEPENDENT VARIABLE
Likelihood of choosing career in industry	Perceptions of level of college education needed

Question 5, *"Does having a family member who works or previously worked in the manufacturing industry impact the likelihood high school students will choose a career in the manufacturing industry?"* was examined using ANOVA to determine if there is a statistically significant relationship between the likelihood students will choose a career in the manufacturing industry and having family members who work or previously worked in industry. The contingency coefficient and Gamma statistics were used to measure the strength of the relationship. The variables are listed in Table 6.

Table 6. *Research Question Five Variables*

DEPENDENT VARIABLE	INDEPENDENT VARIABLE
Likelihood of choosing career in industry	Having family members who work or previously worked in industry

Question 6, *"Does the city, township, or village of residency impact the likelihood high school students will choose a career in the manufacturing industry?"* was examined using a one-way ANOVA to determine if there is a statistically significant relationship between the likelihood students will choose a career in the manufacturing industry and their city, township, or village of residency. The Welch and Brown-Forsythe statistics were used to verify the findings from the ANOVA. The variables are listed in Table 7.

Table 7. *Research Question Six Variables*

DEPENDENT VARIABLE	INDEPENDENT VARIABLE
Likelihood of choosing career in industry	City, township, or village of residency

Question 7, *"Does gender impact the likelihood high school students will choose a career in the manufacturing industry?"* was examined using ANOVA to determine if there is a statistically significant relationship between the likelihood students will choose a career in the manufacturing industry and gender. The Welch and Brown-Forsythe statistics were used to verify the findings from the ANOVA. The variables are listed in Table 8.

Table 8. *Research Question Seven Variables*

DEPENDENT VARIABLE	INDEPENDENT VARIABLE
Likelihood of choosing career in industry	Gender

Question 8, *"Does race impact the likelihood high school students will choose a career in the manufacturing industry?"* was examined using a one-way ANOVA to determine if there is a statistically significant relationship between the likelihood students

will choose a career in the manufacturing industry and race. The Welch and Brown-Forsythe statistics were used to verify the findings from the ANOVA. The variables are listed in Table 9.

Table 9. *Research Question Eight Variables*

DEPENDENT VARIABLE	INDEPENDENT VARIABLE
Likelihood of choosing career in industry	Race

Summary

This chapter described the methodology that was used in analyzing the following questions: (1) Do high school students' perceptions of the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry? (2) What factors have the most influence on the likelihood high school students will choose a career in the manufacturing industry (3) What people have the most influence on the likelihood students will choose a career in the manufacturing industry? (4) Do high school students' perceptions of the level of college education needed to gain employment in the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry? (5) Does having a family member who works or previously worked in the manufacturing industry impact the likelihood high school students will choose a career in the manufacturing industry? (6) Does the city, township, or village of residency impact the likelihood high school students will choose a career in the manufacturing industry? (7) Does gender impact the likelihood high school students will choose a career in the manufacturing industry? (8) Does race impact the likelihood high school students will choose a career in the manufacturing industry? Based on a review of research methods, the researcher determined a quantitative analysis was the most appropriate method for this study. The researcher will utilize descriptive statistics and

analysis of variance to determine the relationship between several environmental, economic, vocational, and educational factors and high school students' perceptions of the manufacturing industry, as well as the impact of their perceptions on the likelihood they will pursue a career in the manufacturing industry. Chapter four will discuss the research findings.

CHAPTER FOUR

RESULTS

The purpose of this study was to explore factors that influence perceptions of the manufacturing industry among high school students and the likelihood they will choose a career in the manufacturing industry. In addition to exploring factors that influence high school students' perceptions of the manufacturing industry, the difference in factors that influence perceptions among sub groups within the population (i.e., socioeconomic status, gender, and race) were also examined. This chapter presents summaries of the pilot study, data collection process, and analysis of data. The data analysis consists of quantitative analysis for the eight research questions included in this study.

Pilot Study

A pilot study was used to test the survey instrument for face validity, a method by which people are asked to evaluate the validity of a test or survey as they see it (Nevo, 1985). The pilot study was conducted on October 2, 2014. The survey instrument was administered electronically to a group of 18 community college students. The survey took from five to seven minutes to complete. Feedback from the pilot group was used to adjust the wording on two questions to make them clearer to the target population.

Data Collection

In order to accommodate the survey delivery needs of each high school, responses were collected using both electronic and paper versions of the survey instrument. The electronic responses were collected using Qualtrics Online Survey Software and Insight

Platform. Of the high schools that accepted the invitation to participate in the study, the principals or their designee determined which classes of students would be administered the survey and whether the paper or electronic version was best to use. The teacher for each class selected administered the survey. Both versions of the survey were made available beginning on October 31, 2014. Participants' responses were collected through January 16, 2015.

A total of 996 participants from 24 different Macomb County high schools participated in the survey. Of those 996, 165 were submitted electronically and 831 were submitted utilizing the paper version of the survey instrument. During data cleaning, it was discovered that of the 24 high schools that participated, five had fewer than 10 participants. This was deemed as inadequate representation for the study, resulting in a total of nine participants from those five high schools being removed from the dataset for analysis purposes. A total of 987 participants' responses were utilized in the study.

Description of Sample Population

The survey instrument consisted of a combination of different items that include a Likert-type scale rating of statements, open-ended, and demographic questions. The information collected is presented in the following sections in summary and tabular format. The data provide a description of the student population surveyed in this study.

Participants' Demographic Information

Summary data in Table 10 show that the sample profile of a high school student who participated in this study is a white male of 17 years of age in grade 12. This profile may differ significantly from the general profile one would obtain if a probability sampling method was used to select high school participants. Participant selection was

entirely outside the confines of the researcher's ability to come up with an adequate representative sample. The high schools' administrative staff and teachers had control over the selection (sampling) process. It is also important to note the inherent advantages and disadvantages that accompany the use of self-reported data. While self-reported data provides researchers a direct route to participants' personal views, the very individualized nature of these views poses a potential validity issue. They may lack truth, both in terms of whether their views represent the real world and whether participants are being truthful with their responses.

Table 10. *Participants' Demographic Information (Gender, Age, Grade, and Race)*

DEMOGRAPHIC VARIABLE		N	PERCENT
Gender	Male	583	59.9
	Female	391	40.1
Age	13	5	0.5
	14	214	21.9
	15	158	16.2
	16	194	19.9
	17	320	32.8
	18	44	4.5
	19 or older	40	4.1
Grade	9	250	25.8
	10	186	19.2
	11	187	19.3
	12	347	35.8
Race	African American	278	28.5
	Asian/Pacific Islander	46	4.7
	Hispanic	29	3.0
	Native American	10	1.0
	White, non-Hispanic	534	54.8
	Other	77	7.9

Summary data in Table 11 indicate participants' city, township, or village of residency. The largest number of participants was from Warren (n=175 or 17.7%), followed by Clinton Township (n=130 or 13.2%) and Mount Clemens (n=110 or 11.1%). The smallest number of participants was from Fraser (n=11 or 1.1%). Of the participants,

the 39 categorized as "other" represents cities with fewer than 10 respondents. A total of 27 participants did not respond to the question of residency.

Summary data in Table 12 indicates the high school that participants attend. A total of 15 participants did not respond to the question of high school attended. The largest number of participants attends Mount Clemens (n=148 or 15.2%), followed by Chippewa Valley (n=126 or 13.0%) and Warren Mott (n=104 or 10.7%). The smallest number of participants attends AdvancePath Academy (n=12 or 1.22%).

Table 11. *Participants' Demographic Information (Gender, Age, Grade, and Race)*

RESIDENCY	N	PERCENT
Center Line	56	5.7
Clinton Township	130	13.2
Detroit	56	5.7
Eastpointe	48	4.9
Fraser	11	1.1
Lenox Township	13	1.3
Macomb Township	72	7.3
Mount Clemens	110	11.1
New Haven	38	3.9
Richmond	54	5.5
Roseville	22	2.2
St Clair Shores	91	9.2
Sterling Heights	45	4.6
Warren	175	17.7
Other[a]	39	4.5

Table 12. *Participants' Demographic Information (High School)*

HIGH SCHOOL	N	PERCENT
AdvancePath Academy	12	1.2
Center Line	96	9.9
Chippewa Valley	126	13.0
Cousino	25	2.6
Dakota	31	3.2
East Detroit	14	1.4
Fitzgerald	24	2.5
Fraser	14	1.4
Kellwood	25	2.6
Lakeview	86	8.8
Lincoln	17	1.7
Michigan Collegiate	24	2.5
Mount Clemens	148	15.2
New Haven	56	5.8
North Lake	24	2.5
Richmond	79	8.1
South Lake	42	4.3

HIGH SCHOOL	N	PERCENT
Sterling Heights	25	2.6
Warren Mott	104	10.7

Participants' Likelihood of Choosing a Career in the Manufacturing Industry

Summary data in Table 13 illustrate participants' responses to the question *"How likely are you to choose a career in the manufacturing industry?"* Of the 980 participants who responded, the most common response was "somewhat likely" (n=249 or 25.4%) followed by "very unlikely" (n=217 or 22.1%). A total of seven participants did not provide a response.

Table 13. *Participants' Likelihood of Choosing a Career in Manufacturing Industry*

VARIABLE	VERY UNLIKELY	UNLIKELY	SOMEWHAT UNLIKELY	SOMEWHAT LIKELY	LIKELY	VERY LIKELY	N	MEAN
How likely are you to choose a career in the manufacturing industry?	217 22.1%	192 19.6%	174 17.8%	249 25.4%	100 10.2%	48 4.9%	980	2.97

Participants' Familial Ties to Manufacturing Industry

Summary data in Table 14 indicate whether participants have family members who (a) currently work or (b) have previously worked in the manufacturing industry. These two questions were subdivided by asking the status of immediate family members (mother, father, sister, brother, and/or grandparent) and extended family members (aunt, uncle, and/or cousin).

Table 14. *Participants' Familial Ties to Manufacturing Industry*

VARIABLE	YES	NO	DON'T KNOW	N
Do any of the following people currently work in the manufacturing industry?				
Immediate family (mother, father, sister, brother, and/or grandparent)	365 37.4%	495 50.7%	117 12.0%	977
Extended family (aunt, uncle, and/or cousin)	417 42.7%	264 27.0%	295 30.2%	976

VARIABLE	YES	NO	DON'T KNOW	N
Have any of the following people previously worked in the manufacturing industry?				
Immediate family (mother, father, sister, brother, and/or grandparent)	479 49.0%	306 31.3%	192 19.7%	977
Extended family (aunt, uncle, and/or cousin)	448 45.9%	212 21.7%	315 32.3%	975

Participants' Perceptions of Level of College Education Needed

Summary data in Table 15 illustrate participants' responses to the question *"How much college education do you think is needed to work in the manufacturing industry?"* Of the 981 who responded, the highest response was "associate's degree" (n=295 or 30.1%). A total of six participants did not provide a response.

Table 15. *Participants' Perceptions of Level of College Education Needed*

VARIABLE	NONE	SOME COLLEGE	ASSOCIATE'S DEGREE	BACHELOR'S DEGREE	MORE THAN BACHELOR'S DEGREE	N
How much college education do you think is needed to work in the manufacturing industry?	205 20.9%	241 24.6%	295 30.1%	168 17.1%	72 7.3%	981

Participants Experience with Manufacturing-Related Classes

Summary data in Table 16 indicate participants' responses to the question *"Have you ever taken any manufacturing-related classes?"* Of the 981 who responded, 218 (22.2%) participants responded "yes," while 763 (77.8%) responded "no." A total of 6 participants did not respond. When considering this data, it is important to note that the career and technical program opportunities available in Macomb County high schools, particularly those in the area of manufacturing, are very limited. Of the 19 high schools that participated, approximately six have in-house career and technical education programs in the manufacturing area.

Table 16. *Participants' Experience with Manufacturing-Related Classes*

VARIABLE	YES	NO	N
Have you ever taken any manufacturing-related classes?	218 22.2%	763 77.8%	981

Students who indicated "yes" were asked to describe the classes they had taken. Of the 218 participants who indicated "yes," 206 of them gave a description of the class. Summary data in Table 17 shows the most common answers, with the most popular response being "woodshop/woodworking" (n=65). Many participants listed multiple classes.

Table 17. *Most Common Manufacturing-Related Courses Participants Cited Taking*

COURSE	COUNT
Woodshop/Woodworking	65
Technical Education	37
Electronics/Mechatronics/Robotics	34
Automotive Technology	30
Drafting	25
Welding	25
Machine Shop/Machine Tool	19

Level of Impact Key Influencers Have on Participants' Perceptions of Industry

Summary data in Table 18 indicate the level of impact participants perceive influencers in their lives have had on their opinion of the manufacturing industry. This question was subdivided by six influencers: friends; immediate family (mother, father, sister, brother, and/or grandparent); extended family (aunt, uncle, and/or cousin); teachers; other school staff members (counselors, advisors, coaches); and mass media (such as television, internet, and radio).

Table 18. *Participants' Perceptions of Influencers' Impact*

VARIABLE	NOT AT ALL	A LITTLE	SOME	A LOT	N	MEAN
How much do you think the following have impacted your opinion of the manufacturing industry?						
Friends	648 66.4%	192 19.7%	114 11.7%	22 2.3%	976	0.50
Immediate family (mother, father, sister, brother, and/ or grandparent)	390 40.0%	255 26.1%	189 19.4%	142 14.5%	976	1.09
Extended family (aunt, uncle, and/ or cousin)	469 48.1%	258 26.4%	152 15.6%	97 9.9%	976	0.87
Teachers	510 52.3%	242 24.8%	161 16.5%	63 6.5%	976	0.77
Other school staff members (counselors, advisors, coaches)	614 62.9%	203 20.8%	116 11.9%	43 4.4%	976	0.58
Mass media (such as television, internet, radio)	265 27.2%	345 35.3%	249 25.5%	117 12.0%	976	2.22

A total of 976 participants responded to these questions, while 11 provided no response. Immediate family members were reported as having the most influence on participants' opinion of the manufacturing industry (n=142 or 14.5%) while friends were reported as having the least influence (n=648 or 66.4%).

Participants' Most Influential Person

Summary data in Table 19 indicates participants' responses to the open-ended question: *"What person in your life has had the most influence on your opinion of the manufacturing industry?"* A total of 590 participants responded with a person. Those responses were recoded into the appropriate category of the six listed in Table 19. "Parent" was the most popular response (n=314 or 53.2%).

Table 19. *Person Cited as Most Influential on Participants' Opinions of Manufacturing*

PERSON	N	PERCENT
Extended family member	88	14.9
Friend	23	3.9
Grandparent	73	12.4
Parent	314	53.2
Sibling	31	5.3
Teacher	61	10.3

Analysis of Data

This study uses quantitative analysis to examine the eight research questions: (1) Do high school students' perceptions of the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry? (2) What factors have the most influence on the likelihood that high school students will choose a career in the manufacturing industry (3) What people have the most influence on the likelihood students will choose a career in the manufacturing industry? (4) Do high school students' perceptions of the level of college education needed to gain employment in the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry? (5) Does having a family member who works or previously worked in the manufacturing industry impact the likelihood high school students will choose a career in the manufacturing industry? (6) Does the city, township, or village of residency impact the likelihood high school students will choose a career in the manufacturing industry? (7) Does gender impact the likelihood high school students will choose a career in the manufacturing industry? (8) Does race impact the likelihood high school students will choose a career in the manufacturing industry? The questions are presented with summary findings and support tables and figures in the following sections.

Perceptions of Manufacturing Industry Index

A Perceptions of Manufacturing Industry Index [PMII] was used to determine whether high school students have negative or positive perceptions of the manufacturing industry. The PMII developed for this study presents 10 statements about the manufacturing industry to participants and asks them to select the response that best describes their opinion about each statement. The responses, on a Likert-based scale, were: 1= strongly disagree, 2=disagree, 3=somewhat disagree, 4=somewhat agree, 5=agree, and 6=strongly agree. The PMII is an additive index created by adding the response scores of all 10 statements about the manufacturing industry. The minimum possible score is 10 and the maximum possible score is 60. Scales on some survey questions were reversed to prevent acquiescence bias; therefore, questions 2, 4, and 8 were recoded appropriately. High scores indicate a positive perception of the manufacturing industry. Table 20 shows the distribution of responses and means.

Table 20. *Distribution of Responses to PMII Statements*

Item	Strongly Disagree 1	Disagree 2	Somewhat Disagree 3	Somewhat Agree 4	Agree 5	Strongly Agree 6	N	Mean
1. Working in the manufacturing industry is physically demanding.	14 1.4%	39 4.0%	96 9.7%	391 39.7%	338 34.3%	107 10.9%	985	4.3
2. Working in the manufacturing industry pays well.	7 0.7%	54 5.5%	118 12.0%	422 42.8%	302 30.7%	82 8.3%	985	4.2
3. Working in the manufacturing industry is boring.	50 5.1%	146 14.8%	233 23.7%	317 32.2%	168 17.1%	70 7.1%	984	3.6
4. A high level of technology is used by people who work in the manufacturing industry.	9 0.9%	32 3.2%	83 8.4%	338 34.3%	374 38.0%	149 15.1%	985	4.5

Item	Strongly Disagree 1	Disagree 2	Somewhat Disagree 3	Somewhat Agree 4	Agree 5	Strongly Agree 6	N	Mean
5. You get dirty when you work in the manufacturing industry.	11 1.1%	40 4.1%	116 11.8%	367 37.3%	311 31.6%	139 14.1%	984	4.4
6. There is a high risk of on-the-job injury for people who work in the manufacturing industry.	12 1.2%	52 5.3%	108 11.0%	349 35.5%	285 29.0%	178 18.1%	984	4.4
7. Facilities in the manufacturing industry are dark.	74 7.5%	329 33.5%	288 29.3%	224 22.8%	48 4.9%	20 2.0%	983	2.9
8. There are many opportunities for career advancement when working in the manufacturing industry.	9 0.9%	65 6.6%	144 14.6%	380 38.7%	282 28.7%	103 10.5%	983	4.2
9. Few women work in the manufacturing industry.	50 5.1%	205 20.9%	241 24.5%	304 30.9%	130 13.2%	53 5.4%	983	3.4
10. Working in the manufacturing industry means you have to work on an assembly line.	105 10.7%	255 25.9%	219 22.3%	257 26.1%	113 11.5%	34 3.5%	983	3.1

Research Question One: *"Do high school students' perceptions of the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry?"*

Frequencies, descriptive statistics, and a one-way analysis of variance (ANOVA) were used to analyze this question. Summary data in Table 21 indicate there is not much variation between the different levels of likelihood of choosing a career in the manufacturing industry. Figure 1 illustrates the PMII ranges from a score of 18 (having a negative perception of the manufacturing industry) to 52 (having a positive perception of the manufacturing industry). Despite this finding, the PMII scores show a progression in

an increasing positive perception of the manufacturing industry; however, Table 22 reveals the association between PMII and the likelihood of choosing a career in the manufacturing industry is weak (eta=0.26). The eta statistic is a measure of association similar to Pearson's correlation statistic or the coefficient of determination (R) for bivariate correlation only, but is more fitting for ordinal-level data. Eta-squared (n^2=0.066) indicates students' perceptions of the manufacturing industry account for only 6.6% of the variation in the likelihood they will choose a career in the manufacturing industry. As indicated in Table 23, the one-way ANOVA determined there was a statistically significant difference between groups ($F(5,979) = 13.809$, $p = .000$). This finding should be interpreted with caution, however, given the fact that the sampling technique used in this study was not random probability.

Table 21. *Mean Perceptions of Industry Index (PMII)*

How likely are you to choose a career in the manufacturing industry?	Mean	N
Very Unlikely	33.90	215
Unlikely	35.16	196
Somewhat Unlikely	36.01	175
Somewhat Likely	36.46	251
Likely	37.55	98
Very Likely	37.96	50
Total	35.75	985

Table 22. *Measures of Association, Research Question One*

	R	R Squared	Eta	Eta Squared
PMII * How likely are you to choose a career in the manufacturing industry?	.253	.064	.257	.066

Table 23. *ANOVA, Research Question One*

Sig.	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1506.503	5	301.301	13.809	.000
Within Groups	21361.057	979	21.819		
Total	22867.559	984			

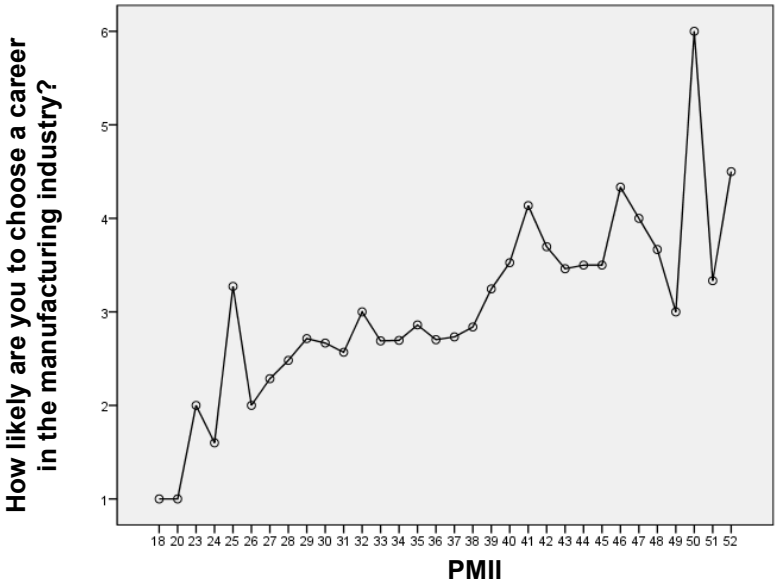

Figure 1. Mean Representation A, Research Question One

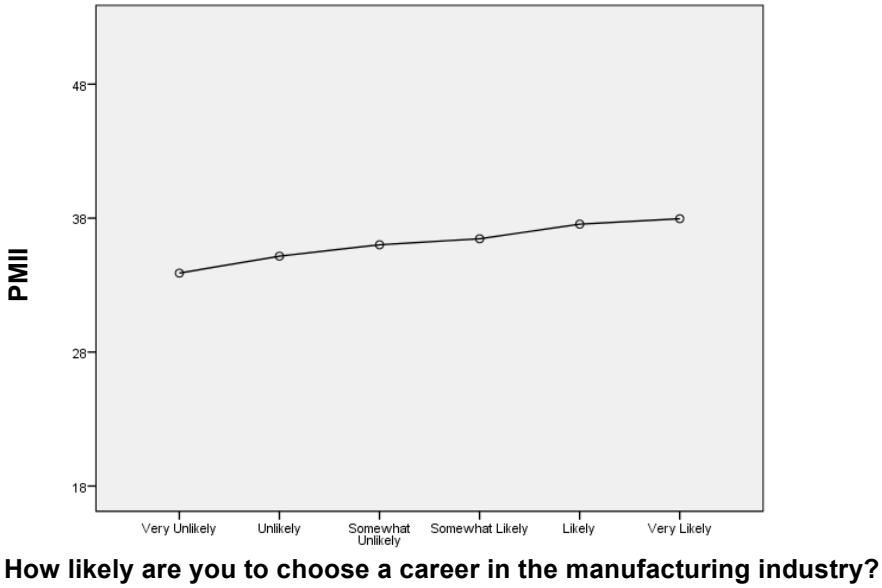

Figure 2. Mean Representation B, Research Question One

As shown in Table 24, a post hoc analysis of multiple comparisons of means using Tukey HSD reveals which categories of likelihood to pursue a career in the manufacturing industry differ with the perception of manufacturing (PMII). Students who are "very unlikely" to choose a career in the manufacturing industry appear to differ significantly in their perception of the industry than all other categories.

Table 24. *Tukey HSD, Research Question One*

How likely are you to choose a career in the manufacturing industry?	How likely are you to choose a career in the manufacturing industry?	Mean difference	Sig.
Very Unlikely	Unlikely	-1.266	.068
	Somewhat Unlikely	-2.114*	.000
	Somewhat Likely	-2.564*	.000
	Likely	-3.653*	.000
	Very Likely	-4.062*	.000
Unlikely	Very Unlikely	1.266	.068
	Somewhat Unlikely	-.848	.502
	Somewhat Likely	-1.299*	.042
	Likely	-2.388*	.001
	Very Likely	-2.797*	.002
Somewhat Unlikely	Very Unlikely	2.114*	.000
	Unlikely	.848	.502
	Somewhat Likely	-.451	.924
	Likely	-1.540	.095
	Very Likely	-1.949	.098
Somewhat Likely	Very Unlikely	2.564*	.000
	Unlikely	1.299*	.042
	Somewhat Unlikely	.451	.924
	Likely	-1.089	.368
	Very Likely	-1.498	.304
Likely	Very Unlikely	3.653*	.000
	Unlikely	2.388*	.001
	Somewhat Unlikely	1.540	.095
	Somewhat Likely	1.089	.368
	Very Likely	-.409	.996
Very Likely	Very Unlikely	4.062*	.000
	Unlikely	2.797*	.002
	Somewhat Unlikely	1.949	.098
	Somewhat Likely	1.498	.304
	Likely	.409	.996

*The mean difference is significant at the 0.05 level.

Research Question Two: "*What factors have the most influence on the likelihood that high school students will choose a career in the manufacturing industry?"*

Somers'd and Gamma were applied to measure the association between each individual PMII statement and the likelihood of students choosing a career in the manufacturing industry. The results of Somers'd and Gamma are displayed in Table 25. The results show the variable "working in the manufacturing industry is physically demanding" is not associated with the likelihood of students choosing a career in the manufacturing industry (Somers'd = -.009, Gamma=-.012, p = .747).

The results show the variable "working in the manufacturing industry pays well" is weakly associated with the likelihood of students choosing a career in the manufacturing industry (Somers'd = .278, Gamma = .367, p = .001). The positive association signifies that, the more a student agrees with the statement "working in the manufacturing industry pays well," the more likely the student would be to choose a career in the manufacturing industry.

The results show the variable "working in the manufacturing industry is boring" is associated with the likelihood of students choosing a career in the manufacturing industry. The Somers'd result is -.270 and the Gamma result is -.337, indicating a fairly moderate association that is statistically significant (p = .000). The negative association signifies that, the more a student agrees with the statement "working in the manufacturing industry is boring," the less likely the student would be to choose a career in the manufacturing industry.

The results show the variable "a high level of technology is used by people who work in the manufacturing industry" is associated with the likelihood of students choosing a career in the manufacturing industry. The Somers'd result is .068 and the Gamma result is .090, indicating a mild association that is statistically significant (p = .011). The positive association is somewhat indicative that, the more a student agrees with the statement "a high level of technology is used by people who work in the manufacturing industry," the more likely the student would be to choose a career in the manufacturing industry.

Table 25. *Results of Directional Association Tests Using Somers'd and Gamma, PMII Statements * Likelihood of Choosing Career in Manufacturing Industry*

Dependent Variable	Independent Variable	N	Somers' *D*	Gamma	Approx. *T*	Approx. Sig.
How likely are you to choose a career in the manufacturing industry?	Working in the manufacturing industry is physically demanding.	987	-.009	-.012	-.323	.747
	Working in the manufacturing industry pays well.	987	.278	.367	10.541	.000**
	Working in the manufacturing industry is boring.	987	-.270	-.337	-10.327	.000**
	A high level of technology is used by people who work in the manufacturing industry.	987	.068	.090	2.552	.011*
	You get dirty when you work in the manufacturing industry.	987	-.008	-.010	-.288	.773
	There is a high risk of on-the-job injury for people who work in the manufacturing industry.	987	-.086	-.110	-3.226	.001**
	Facilities in the manufacturing industry are dark.	987	-.046	-.059	-1.622	.105
	There are many opportunities for career advancement when working in the manufacturing industry.	987	.228	.295	8.738	.000**
	Few women work in the manufacturing industry.	987	.022	.027	.807	.420
	Working in the manufacturing industry means you have to work on an assembly line.	987	.016	.019	.570	.569

The results show the variable "you get dirty when you work in the manufacturing industry" is not associated with the likelihood of students choosing a career in the manufacturing industry (Somers'd = -.008, Gamma = -.010, p = .773).

The results show the variable "there is a high risk of on-the-job injury for people who work in the manufacturing industry" is associated with the likelihood of students choosing a career in the manufacturing industry. The Somers'd result is -.086 and the

Gamma result is -.110, indicating a mild association that is statistically significant (p = .001). The negative association is somewhat indicative that, the more a student agrees with the statement "there is a high risk of on-the-job injury for people who work in the manufacturing industry," the less likely the student would be to choose a career in the manufacturing industry.

The results show the variable "facilities in the manufacturing industry are dark" is not associated with the likelihood of students choosing a career in the manufacturing industry (Somers'd = -.046, Gamma = -.059, p = .105).

The results show the variable "there are many opportunities for career advancement when working in the manufacturing industry" is associated with the likelihood of students choosing a career in the manufacturing industry. The Somers'd result is .228 and the Gamma result is .295, indicating a fairly moderate association that is statistically significant (p = .000). The positive association signifies that, the more a student agrees with the statement "there are many opportunities for career advancement when working in the manufacturing industry," the more likely the student is to choose a career in the manufacturing industry.

The results show the variable "few women work in the manufacturing industry" is not associated with the likelihood of students choosing a career in the manufacturing industry (Somers'd = .022, Gamma = .027, p = .420). Results for an additional variable "working in the manufacturing industry means you have to work on an assembly line" similarly show no association with the likelihood of students choosing a career in the manufacturing industry (Somers'd = .016, Gamma = .019, p = .569).

Influence of taking manufacturing-related classes. A one-way ANOVA was used to measure the association between whether students have taken a manufacturing-related class and the likelihood of them choosing a career in the manufacturing industry. As indicated in Table 26, the one-way ANOVA determined there was a statistically significant difference between groups ($F(1,977) = 18.666$, $p = .000$).

Table 26. *ANOVA, Taking a Manufacturing-related Class * Likelihood of Choosing Career in Manufacturing Industry*

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG.
Between Groups	40.116	1	40.116	18.666	.000
Within Groups	2099.771	977	2.149		
Total	2139.888	978			

Table 27. *Robust Tests of Equality of Means, Taking a Manufacturing-related Class * Likelihood of Choosing Career in Manufacturing Industry*

	STATISTIC	DF1	DF2	SIG.
Welch	17.409	1	332.228	.000
Brown-Forsythe	17.409	1	332.228	.000

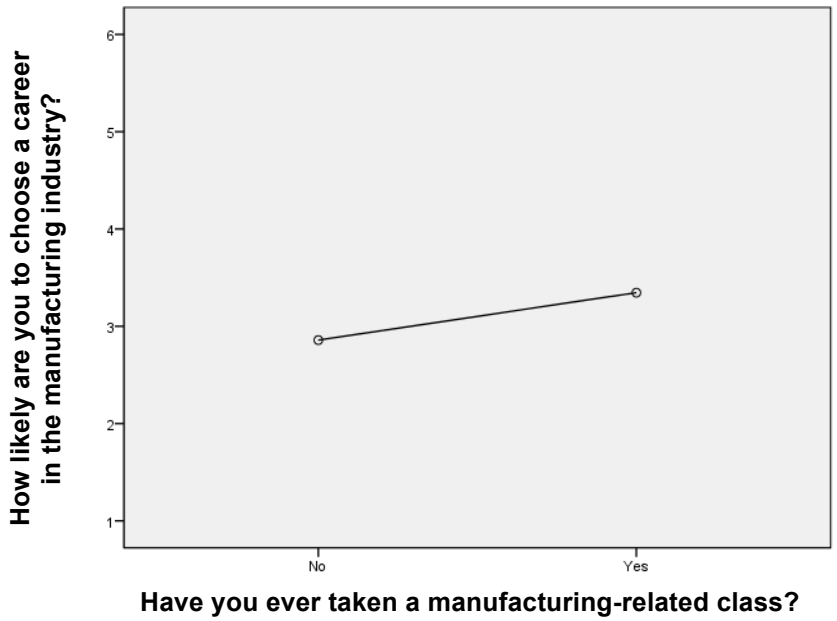

*Figure 3. Mean Representation, Taking a Manufacturing-related Class * Likelihood of Choosing Career in Manufacturing Industry*

Because the assumption of equal variances does not hold, the Welch and Brown-Forsythe statistics were also used. As indicated in Table 27, these statistics support the finding of a statistically significant relationship between whether students have taken a manufacturing-related class and the likelihood they will choose a career in the manufacturing industry (Welch = 17.409, p = .000; Brown-Forsythe = 17.409, p = .000). Figure 3 shows that the mean likelihood of choosing a career in the manufacturing industry is related to whether students have taken a manufacturing-related class.

Impact of participants' most influential person. Summary data in Table 28 shows the distribution of the relationship between students' likelihood of choosing a career in the manufacturing industry and the impact of the person students indicated as most influential on their opinion of the manufacturing industry. Figure 4 shows the mean likelihood of choosing a career in the manufacturing industry is related to the impact of the person students indicated as most influential on their opinion of the manufacturing industry, but it is important to note the numbers of each person chosen are not equal.

Table 28. *Crosstab, Person Students Perceive as Most Influential on Their Opinion of Manufacturing Industry * Likelihood of Choosing Career in Manufacturing Industry*

How likely are you to choose a career in the manufacturing industry?	Extended family member	Friend	Grandparent	Parent	Sibling	Teacher	Total
Very unlikely	17 19.3%	1 4.3%	28 38.4%	45 14.45	3 9.7%	8 13.1%	102 17.3%
Unlikely	29 33.0%	6 26.1%	7 9.6%	51 16.3%	4 12.9%	18 29.5%	115 19.5%
Somewhat unlikely	11 12.5%	4 17.4%	12 16.4%	61 19.5%	7 22.6%	8 13.1%	103 17.5%
Somewhat likely	22 25.0%	7 30.4%	17 23.3%	93 29.7%	11 35.5%	17 27.9%	167 28.4%
Likely	6 6.8%	5 21.7%	6 8.2%	38 12.1%	3 9.7%	8 13.1%	66 11.2%
Very likely	3 3.4%	0 0.0%	3 4.1%	25 8.0%	3 9.7%	2 3.3%	36 6.1%
Total	88 100%	23 100%	73 100%	313 100%	31 100%	61 100%	589 100%

Table 29. *Measures of Association, Person Students Perceive as Most Influential on Their Opinion of Manufacturing * Likelihood of Choosing Career in Manufacturing*

Contingency Coefficient	Sig.	Eta	Eta Squared
.383	.000	.191	.036

Table 29 reveals the relationship between the impact of the person who students perceive as the most influential on their opinion of the manufacturing industry and the likelihood they will choose a career in the manufacturing industry is weak. The contingency coefficient is .383 (p = .000) and the eta statistic is .191. Eta-squared (n^2=0.036) indicates that the impact of the person who students perceive as the most influential on their opinion of the manufacturing industry accounts for only 3.6% of the variation in the likelihood they will choose a career in the manufacturing industry.

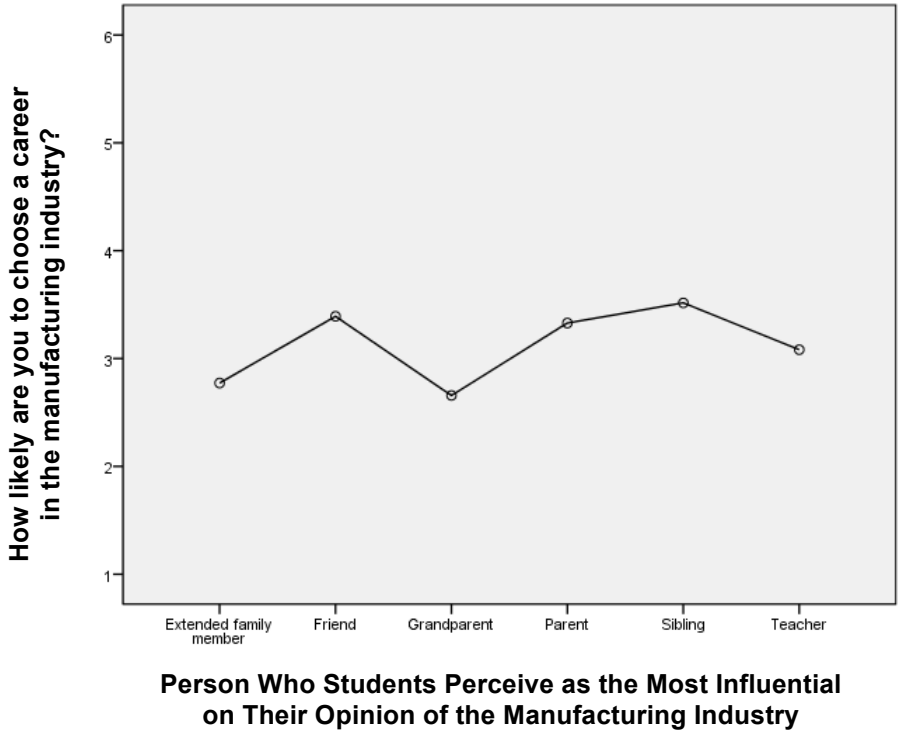

*Figure 4. Mean Representation, Most Influential Person * Likelihood of Choosing Career in Manufacturing Industry*

Logistic regression analysis. The preceding analyses examined the strength of relationships between two variables individually, without controlling for additional factors, or predictor variables. Logistic regression analysis is a probability model that allows the examination of the effect of all variables simultaneously, accounting for the impact of each predictor variable, while the other predictor variables are controlled for. The logistic regression model used in this study includes factors that came out as fairly good predictors of likelihood to choose a career in manufacturing among high school students in the initial primary research question which is "*What factors have the most influence on the likelihood that high school students will choose a career in the manufacturing industry?"* All variables that were found to have a fairly moderate association with the likelihood of choosing a career in the manufacturing industry were included. They consist of the following survey items.

1. Question 2: Students' rating of *"Working in the manufacturing industry pays well."*
2. Question 3: Students' rating of *"Working in the manufacturing industry is boring."*
3. Question 8: Students' rating of *"There are many opportunities for career advancement when working in the manufacturing industry."*
4. PMII: Additive index of all the rating scores (Questions 1 through 10) about manufacturing industry
5. Question 29: Students' gender
6. Question 13: Students' yes/no response to *"Have you ever taken any manufacturing-related classes?"*

7. Question 18: Students' response to *"How much do you think your friends have influence your opinion of the manufacturing industry?"*
8. Question 19: Students' response to: *"How much do you think your immediate family has influenced your opinion of the manufacturing industry?"*
9. Question 20: Students' response to: *"How much do you think your extended family has influenced your opinion of the manufacturing industry?"*
10. Question 21: Students' response to *"How much do you think your teachers have influenced your opinion of the manufacturing industry?"*

In logistic regression, it is necessary to code the categorical variables to create a reference category to compare them with the other predictor categorical variables. The reference category is the one rated the lowest. The initial results of the regression show that the model had an 11.7 % predictive ability when all the variables are were taken into account, with a Nagelkerke R^2 of 0.27. The logistic regression's Nagelkerke R^2 is similar to the coefficient of determination R^2 used in the generalized linear regression model (GLMM). This means that all factors included in the model account for 27% of the variation in the probability of the likelihood of choosing a career in manufacturing among high school students. The results of the logistic regression are presented in Table 30.

Industry pays well. The ratings on this item show that it is not a significant predictor in the likelihood of students choosing a career in the manufacturing industry when controlling for all other factors in the model (p = .999).

Work is boring. The B coefficients are negative, meaning that the more students agree that working in the manufacturing industry is boring, the less likely they are to choose a career in the industry, but this applies only to those students who "somewhat

agree," "agree," and "strongly agree" as shown by the *p* values ($p = 0.013$; $p = 0.000$; $p = 0.034$ respectively).

Career advancement. Despite the fact that those who strongly agree that there are many opportunities for career advancement when working in the manufacturing industry are 8.7 times more likely to choose a career in the manufacturing industry than those who strongly disagree, there is no statistical significance difference across all categories of this variable in predicting the likelihood of choosing a career in manufacturing.

PMII. When controlling for all other factors in the model, the PMII score of opinion about the manufacturing industry is not a strong and significant predictor in the likelihood of students choosing a career in the manufacturing ($p = .70$).

Gender. Gender is highly significant in predicting the likelihood of students choosing a career in the manufacturing industry. Males are 2.03 times more likely to choose a career in the industry than females and the effect of gender is statistically significant ($p = .000$). This is not a surprising result, given the fact that gender socialization toward a career in manufacturing tends to lean more in favor of males.

Taken a manufacturing-related class. Although this variable was shown to be a fairly good predictor in choosing a career in manufacturing in the bivariate analysis, the results reveal that when controlling for all other variables the effect diminishes completely. Students who took manufacturing-related courses are only 1.3 times more likely to choose a career in the manufacturing industry. Regardless of this, the effect is not statistically significant ($p = 0.138$).

Friends' influence. Only those students who indicated that friends influenced their opinion of the manufacturing industry "a little" show some effect in the probability of pursuing a career in manufacturing. These students are 1.9 times more likely to pursue a career in the industry than those students who said their friends had no influence at all (p = .001).

Immediate family influence. Regardless of the extent of influence from the immediate family members on students' opinions of the manufacturing industry (*i.e.,* "not at all," "a little," "some," or "a lot"), results show the effect is not significant in predicting whether students will pursue a career in the manufacturing industry.

Extended family influence. Same as above, regardless of the extent of influence from the extended family members on students' opinions of the manufacturing industry, results show the effect is not significant in predicting whether students will pursue a career in the manufacturing industry.

Teachers' influence. The level of the teachers' influence on students' opinions of the manufacturing industry does not appear to be a strong predictor in determining whether high school students will choose a career in the manufacturing industry.

Review of logistic regression analysis. The results of the logistic regression reveal that when controlling for all the factors simultaneously, only a few factors stand out as good predictors of whether high school students will pursue a career in the manufacturing industry. They are gender and some opinion statements (*i.e.,* working in industry is boring). Surprisingly, taking a manufacturing-related course, although initially showing some effect in predicting the likelihood of choosing a career in manufacturing, diminishes when other factors are taken into account.

Table 30. *Logistic Regression Results*

	B	S.E.	WALD	DF	SIG.	EXP (B)
SQ no. 2: Industry pays well			23.484	5	.000	
Q2(1 Disagree)	19.672	14145.189	.000	1	.999	8336.992
Q2(2 Somewhat Disagree)	19.946	14145.189	.000	1	.999	4596.478
Q2(3 Somewhat Agree)	20.073	14145.189	.000	1	.999	6140.476
Q2(4 Agree)	20.767	14145.189	.000	1	.999	1077.162
Q2(5 Strongly Agree)	20.798	14145.189	.000	1	.999	1276.407
SQ no. 3: Work is boring			26.753	5	.000	
Q3(1 Disagree)	-.257	.407	.400	1	.527	.773
Q3(2 Somewhat Disagree)	-.549	.397	1.906	1	.167	.578
Q3(3 Somewhat Agree)	-.988	.399	6.137	1	.013*	.372
Q3(4 Agree)	-1.585	.439	13.018	1	.000***	.205
Q3(5 Strongly Agree)	-1.051	.496	4.489	1	.034*	.350
SQ no. 8: Career advancement			17.756	5	.003	
Q8(1 Disagree)	.753	1.194	.398	1	.528	2.123
Q8(2 Somewhat Disagree)	1.163	1.166	.995	1	.319	3.200
Q8(3 Somewhat Agree)	1.720	1.154	2.223	1	.136	5.584
Q8(4 Agree)	1.698	1.155	2.162	1	.142	5.462
Q8(5 Strongly Agree)	2.163	1.163	3.460	1	.063	8.695
PMII	-.008	.020	.148	1	.700	.992
SQ no. 29: Gender (male)	.709	.153	21.356	1	.000***	**2.032**
SQ no. 13: Taken a manufacturing-related class (yes)	.266	.179	2.198	1	.138	1.305
SQ no. 18: Friends' influence			1.023	3	.012	
Q18 (1 A little)	.678	.204	11.015	1	.001**	1.970
Q18 (2 Some)	.290	.259	1.252	1	.263	1.337
Q18 (3 A lot)	.324	.517	.393	1	.531	1.383
SQ no. 19: Immediate family influence			4.066	3	.254	
Q19 (1 A little)	.226	.220	1.056	1	.304	1.253
Q19 (2 Some)	.353	.244	2.089	1	.148	1.423
Q19 (3 A lot)	.572	.296	3.726	1	.054	1.772
SQ no. 20: Extended family influence			1.200	3	.753	
Q20 (1 A little)	.128	.212	.368	1	.544	1.137
Q20 (2 Some)	.258	.262	.965	1	.326	1.294
Q20 (3 A lot)	.023	.337	.005	1	.945	1.023
SQ no. 21: Teachers' influence			.182	3	.980	
Q21(1 A little)	-.012	.191	.004	1	.952	.988
Q21 (2 Some)	.005	.221	.001	1	.982	1.005
Q21 (3 A lot)	.131	.339	.151	1	.698	1.141
Constant	-23.190	14145.190	.000	1	.999	.000

*p< 0.05; **p< 0.01; ***p <0.001

Research Question Three: *"What people have the most influence on the likelihood students will choose a career in the manufacturing industry?"*

An analysis of students' friends' influence using one-way ANOVA, as illustrated in Table 31, reveals there was a statistically significant difference between groups ($F(3,979) = 23.736$, $p = .000$). Because the assumption of equal variances does not hold, the Welch and Brown-Forsythe statistics were also used. As indicated in Table 32, these statistics support the finding of a statistically significant relationship between students' friends' influence on their opinions of the manufacturing industry and the likelihood they will choose a career in the industry (Welch = 23.432, $p = .000$ and Brown-Forsythe = 18.231, $p = .000$). The results of the Somers'd and Gamma tests (Table 33) show students' friends' influence is associated with the likelihood they will choose a career in the industry. The Somers'd result is .208 and the Gamma result is .329, indicating a moderate association that is statistically significant ($p = .000$). The positive association signifies that, the more a student believes her friends have influenced her opinion of the manufacturing industry, the more likely she is to choose a career in the industry.

Table 31. *ANOVA, Research Question Three*

	Source	Sum of Squares	df	Mean Square	F	Sig.
Friends' influence	Between Groups	145.899	3	48.633	23.736	.000
	Within Groups	2005.855	979	2.049		
	Total	2151.754	982			
Immediate family members' influence	Between Groups	129.320	3	43.107	20.867	.000
	Within Groups	2022.434	979	2.066		
	Total	2151.754	982			
Extended family members' influence	Between Groups	106.617	3	35.539	17.0112	.000
	Within Groups	2045.137	979	2.089		
	Total	2151.754	982			
Teachers' influence	Between Groups	91.202	3	30.401	14.444	.000
	Within Groups	2060.551	979	2.105		
	Total	2151.754	982			
Other school staff members' influence	Between Groups	75.954	3	25.318	11.941	.000
	Within Groups	2075.800	979	2.120		
	Total	2151.754	982			

An analysis of students' immediate family members' influence using one-way ANOVA, as illustrated in Table 31, determined there was a statistically significant difference between groups ($F(3,979) = 20.867$, $p = .000$). As indicated in Table 32, the Welch and Brown-Forsythe statistics support the finding of a statistically significant relationship between students' immediate family members' influence on their opinions of the manufacturing industry and the likelihood they will choose a career in the industry (Welch = 19.099, $p = .000$ and Brown-Forsythe = 19.910, $p = .000$). The result of the Somers'd and Gamma tests (Table 33) show students' immediate family members' influence is associated with the likelihood they will choose a career in the manufacturing industry. The Somers'd result is .199 and the Gamma result is .262, indicating a fairly moderate association that is statistically significant ($p = .000$). The positive association signifies that, the more a student believes her immediate family members have influenced her opinion of the manufacturing industry, the more likely she is to choose a career in the industry.

Table 32. *Robust Tests of Equality of Means, Research Question Three*

		STATISTIC	DF1	DF2	SIG.
Friends' influence	Welch	23.432	3	91.092	.000
	Brown-Forsythe	18.231	3	87.395	.000
Immediate family members' influence	Welch	19.099	3	425.080	.000
	Brown-Forsythe	19.910	3	672.607	.000
Extended family members' influence	Welch	16.538	3	312.015	.000
	Brown-Forsythe	15.711	3	455.067	.000
Teachers' influence	Welch	13.154	3	239.428	.000
	Brown-Forsythe	13.942	3	345.846	.000
Other school staff members' influence	Welch	12.018	3	159.019	.000
	Brown-Forsythe	11.600	3	227.382	.000

An analysis of students' extended family members' influence using one-way ANOVA, as illustrated in Table 31, determined there was no statistically significant difference between groups ($F(3,979) = 17.0112$, $p = .000$). As indicated in Table 32, the

Welch and Brown-Forsythe statistics support the finding that there is no statistically significant relationship between students' extended family members' influence on their opinions of the manufacturing industry and the likelihood they will choose a career in the manufacturing industry (Welch = 16.538, p = .000 and Brown-Forsythe = 15.711, p = .000). The results of the Somers'd and Gamma tests (Table 33) shows students' extended family members' influence is not associated with the likelihood they will choose a career in the manufacturing industry.

Table 33. *Results of Directional Association Tests Using Somers'd and Gamma, Research Question Three*

Dependent Variable	Independent Variable	N	Somers' *D*	Gamma	Approx. *T*	Approx. Sig.
Likelihood of choosing career in industry.	Friends' influence	983	.208	.329	7.926	.000
	Immediate family members' influence	974	.199	.262	7.498	.000
	Extended family members' influence	983	.182	.248	6.765	.000
	Teachers' influence	983	.164	.229	6.220	.000
	Other school staff members' influence	983	.162	.247	6.179	.000

An analysis of students' teachers' influence, using one-way ANOVA as illustrated in Table 31, determined there was a statistically significant difference between groups (F(3,979) = 14.444, p = .000). As indicated in Table 32, the Welch and Brown-Forsythe statistics support the finding of a statistically significant relationship between students' teachers' influence on their opinions of the manufacturing industry and the likelihood they will choose a career in the industry (Welch = 13.154, p = .000 and Brown-Forsythe = 13.942, p = .000). The results of the Somers'd and Gamma tests (Table 33) show students' teachers' influence is moderately/ associated with the likelihood they will choose a career in the manufacturing industry. The Somers'd result

is .164 and the Gamma result is .229, indicating a fairly moderate association that is statistically significant (p = .000). The positive association signifies that, the more a student believes her teachers have influenced her opinion of the manufacturing industry, the more likely she is to choose a career in the industry.

An analysis of students' other school staff members' influence, using one-way ANOVA as illustrated in Table 31, determined there was no statistically significant difference between groups ($F(3,979) = 25.318$, p = .000). As indicated in Table 32, the Welch and Brown-Forsythe statistics support the finding of no statistically significant relationship between students' other school staff members' influence on their opinions of the manufacturing industry and the likelihood they will choose a career in the manufacturing industry (Welch = 12.018, p = .000 and Brown-Forsythe = 11.600, p = .000). The result of the Somers'd and Gamma tests (Table 33) show students' other school staff members' influence is not associated with the likelihood they will choose a career in the industry (Somers'd = .162, Gamma = .247, p = .000).

Research Question Four: *"Do high school students' perceptions of the level of college education needed to gain employment in the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry?"*

Summary data of the ANOVA results in Table 34 reveals there is no significant relationship between the likelihood students will choose a career in the manufacturing industry and their perception of the level of college education to work in the industry ($F(4,975) = 2.234$, p = .064). Table 35 shows the non-parametric measures of association are weak; the contingency coefficient and Gamma are .180 and .090 respectively.

Table 34. *ANOVA, Research Question Four*

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	19.432	4	4.858	2.234	.064
Within Groups	2120.457	975	2.175		
Total	2139.889	979			

Table 35. *Symmetric Measures, Research Question Four*

		Value	Asymp. Std. Error	Approx. T	Approx. Sig.
Nominal by Nominal	Contingency Coefficient	.180			.032
Ordinal by Ordinal	Gamma	.090	.034	2.622	.009

Research Question Five: *"Does having a family member who works or previously worked in the manufacturing industry impact the likelihood high school students will choose a career in the manufacturing industry?"*

Summary data of the ANOVA results in Table 36 reveals there is no significant relationship between the likelihood students will choose a career in the manufacturing industry and them having immediate family members who currently work in the manufacturing industry ($F(2,972) = 12.972$, $p = .000$). As shown in Table 37, the contingency coefficient is .181 ($p = .000$) and Gamma is -.097 ($p = .014$), supporting this finding.

Table 36. *ANOVA, Research Question Five*

	Source	Sum of Squares	df	Mean Square	F	Sig.
Immediate family currently work in industry	Between Groups	55.575	2	27.788	12.972	.000
	Within Groups	2082.168	972	2.142		
	Total	2137.744	974			
Immediate family previously worked in industry	Between Groups	33.531	2	16.766	7.748	.000
	Within Groups	2103.283	972	2.164		
	Total	2136.814	974			
Extended family currently work in industry	Between Groups	19.292	2	9.646	4.423	.012
	Within Groups	2117.521	971	2.181		
	Total	2136.813	973			
Extended family previously worked in industry	Between Groups	5.228	2	2.614	1.190	.305
	Within Groups	2130.513	970	2.196		
	Total	2135.741	972			

Similarly, summary data of the ANOVA results in Table 36 reveals there is no significant relationship between the likelihood students will choose a career in the manufacturing industry and them having immediate family members who previously worked in the manufacturing industry ($F(2,972) = 7.748$, $p = .000$). As shown in Table 37, the contingency coefficient is .164 ($p = .003$) and Gamma is -.088 ($p = .021$), supporting this finding.

Summary data of the ANOVA results in Table 36 reveals there is no significant relationship between the likelihood students will choose a career in the manufacturing industry and them having extended family members who currently work in the manufacturing industry ($F(2,971) = 4.423$, $p = .012$). As shown in Table 37, the contingency coefficient is .164 ($p = .003$) and Gamma is -.004 ($p = .919$), supporting this finding.

Table 37. *Symmetric Measures, Research Question Five*

		Value	Asymp. Std. Error	Approx. T	Approx. Sig.
Immediate family currently work in industry	Contingency Coefficient	.181			.000
	Gamma	-.097	.040	-2.447	.014
Immediate family previously worked in industry	Contingency Coefficient	.164			.003
	Gamma	-.088	.038	-2.301	.021
Extended family currently work in industry	Contingency Coefficient	.138			.040
	Gamma	-.004	.036	-.102	.919
Extended family previously worked in industry	Contingency Coefficient	.104			.391
	Gamma	-.043	.037	-1.148	.251

Again, similarly, summary data of the ANOVA results in Table 36 reveals there is no significant relationship between the likelihood students will choose a career in the manufacturing industry and them having extended family members who previously worked in the manufacturing industry ($F(2,970) = 1.190$, $p = .012$). As shown in Table

37, the contingency coefficient is .104 (p = .391) and Gamma is -.043 (p = .251), supporting this finding.

Research Question Six: *"Does the city, township, or village of residency impact the likelihood high school students will choose a career in the manufacturing industry?"*

Summary data in table 40 shows the mean distribution of students' city, township, or village of residency on the likelihood of them choosing a career in the manufacturing industry. An analysis using one-way ANOVA, as illustrated in Table 38, determined there was a statistically significant difference between groups ($F(13,905) = 3.599$, p = .000).

Table 38. *ANOVA, Research Question Six*

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	97.138	13	7.472	3.599	.000
Within Groups	1879.182	905	2.076		
Total	1976.320	918			

Because the assumption of equal variances does not hold, the Welch and Brown-Forsythe statistics were also used. As indicated in Table 39, these statistics support the finding of a statistically significant relationship between students' city, township, or village or residency and the likelihood they will choose a career in the manufacturing industry (Welch = 3.842, p = .000 and Brown-Forsythe = 3.446, p = .000).

Table 39. *Robust Tests of Equality of Means, Research Question Six*

	Statistic	df1	df2	Sig.
Welch	3.842	13	172.916	.000
Brown-Forsythe	3.446	13	367.428	.000

Figure 5 shows the mean likelihood of choosing a career in the manufacturing industry is related students' city, township or village of residency, but it is important to note the numbers of area of residency are not equal (Table 40).

Table 40. *Mean Distribution, Research Question Six*

City, Township, or Village of Residency	N	Mean
Center Line	56	3.61
Clinton Township	130	3.06
Detroit	56	3.04
Eastpointe	48	3.13
Fraser	11	4.64
Lenox Township	13	2.85
Macomb Township	70	2.71
Mount Clemens	110	2.95
New Haven	38	2.87
Richmond	54	2.81
Roseville	22	2.91
St Clair Shores	91	2.57
Sterling Heights	45	2.36
Warren	175	3.11

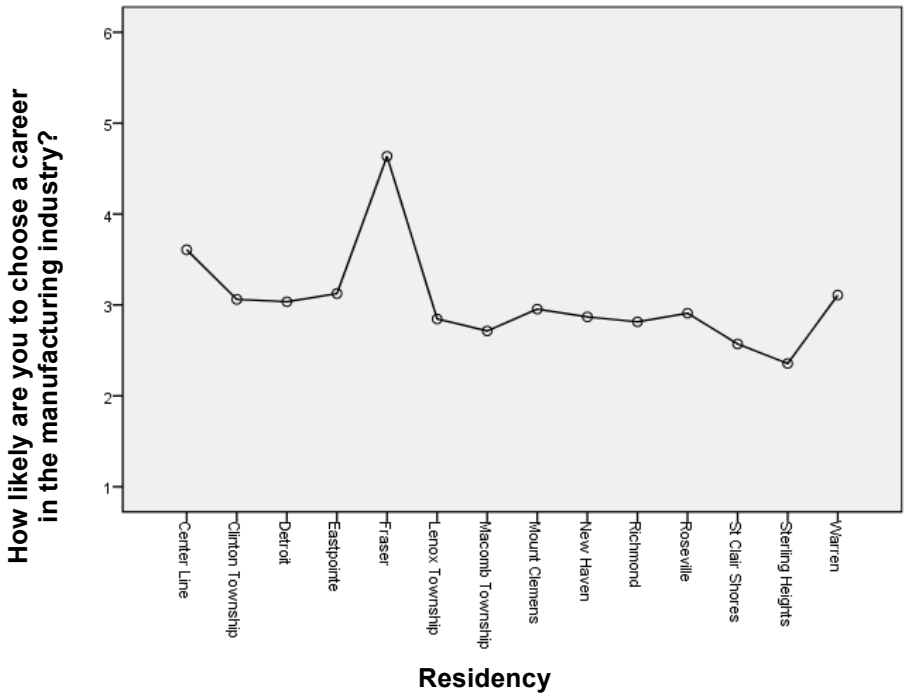

Figure 5. Mean Representation, Research Question Six.

Research Question Seven: *"Does gender impact the likelihood high school students will choose a career in the manufacturing industry?"*

Summary data in Table 41 shows the distribution of the relationship between students' likelihood of choosing a career in the manufacturing industry and their gender. As indicated in Table 42, the one-way ANOVA determined that there was a statistically significant difference between male and female participants ($F = 53.928$, $p = .000$). Because the assumption of equal variances does not hold, the Welch and Brown-Forsythe statistics were also used. As indicated in Table 43, these statistics support the finding of a statistically significant relationship between students' gender and the likelihood they will choose a career in the manufacturing industry (Welch = 55.123, $p = .000$ and Brown-Forsythe = 55.123, $p = .000$).

Table 41. *Crosstab. Research Question Seven*

How likely are you to pursue a career in the manufacturing industry?	Female	Male	Total
Very Unlikely	109 32.1%	87 16.7%	196 22.7%
Unlikely	86 25.3%	90 17.2%	176 20.4%
Somewhat Unlikely	53 15.6%	100 19.2%	153 17.7%
Somewhat Likely	66 19.4%	142 27.2%	208 24.1%
Likely	19 5.6%	66 12.6%	85 9.9%
Very Likely	7 2.1%	37 7.1%	44 5.1%
Total	340 100%	522 100%	862 100%

Table 42. *ANOVA, Research Question Seven*

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	111.938	1	111.938	53.928	.000
Within Groups	2032.083	979	2.076		
Total	2144.020	980			

Table 43. *Robust Tests of Equality of Means, Research Question Seven*

	STATISTIC	DF1	DF2	SIG.
Welch	55.123	1	876.655	.000
Brown-Forsythe	55.123	1	876.655	.000

Research Question Eight: *"Does race impact the likelihood high school students will choose a career in the manufacturing industry?"*

Summary data in Table 44 shows the relationship between students' likelihood of choosing a career in the manufacturing industry and their race. As indicated in Table 45, the one-way ANOVA determined that there was not a statistically significant difference between groups ($F(5,974) = 1.890$, $p = .094$). Because the assumption of equal variances does not hold, the Welch and Brown-Forsythe statistics were also used. As indicated in Table 46, these statistics support the finding of no statistically significant relationship between students' race and the likelihood they will choose a career in the manufacturing industry (Welch = 1.957, $p = .000$ and Brown-Forsythe = 2.057, $p = .000$).

Table 44. *Crosstab, Research Question Eight*

HOW LIKELY ARE YOU TO PURSUE A CAREER IN THE MANUFACTURING INDUSTRY?	WHITE, NON-HISPANIC	AFRICAN AMERICAN	HISPANIC	ASIAN/ PACIFIC ISLANDER	NATIVE AMERICAN	OTHER	TOTAL
Very Unlikely	129 23.9%	53 19.1%	4 13.3%	8 17.8%	3 30.0%	19 24.4%	216 22.0%
Unlikely	123 22.8%	47 16.9%	3 10.0%	7 15.6%	3 30.0%	13 16.7%	196 20.0%
Somewhat Unlikely	78 14.5%	56 20.1%	5 16.7%	14 31.1%	1 10.0%	18 23.1%	172 17.6%
Somewhat Likely	132 24.5%	71 25.5%	15 50.0%	11 24.4%	2 20.0%	17 21.8%	248 25.3%
Likely	53 9.8%	34 12.2%	2 6.7%	2 4.4%	1 10.0%	8 10.3%	100 10.2%
Very Likely	24 4.5%	17 6.1%	1 3.3%	3 6.7%	0 0.0%	3 3.8%	48 4.9%
Total	539 100%	278 100%	30 100%	45 100%	10 100%	78 100%	980 100%

Table 45. *ANOVA, Research Question Eight*

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG.
Between Groups	20.549	5	4.110	1.890	.094
Within Groups	2118.129	974	2.175		
Total	2138.678	979			

Table 46. *Robust Tests of Equality of Means, Research Question Eight*

	STATISTIC	DF1	DF2	SIG.
Welch	1.957	5	66.992	.096
Brown-Forsythe	2.057	5	146.138	.074

Summary

The data presented in this chapter revealed factors that influence high school students' perceptions of the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry. Students who trend toward having a negative perception of the manufacturing industry are unlikely to even consider employment in the industry as a viable career option.

Several factors influence students' opinions of the manufacturing industry. Analysis of the relationships between two variables individually was conducted first. This analysis revealed that higher levels of students' agreement with the following statements were of significance in negatively impacting their likelihood of choosing a career in the manufacturing industry: (1) "working in the manufacturing industry is boring," and (2) "there is a high risk of on-the-job injury for people who work in the manufacturing industry." Conversely, higher levels of students' agreement with the following statements were found to be of significance in having a positive impact: (1) "working in the manufacturing industry pays well," (2) "a high level of technology is used by people who work in the manufacturing industry," and (3) "there are many opportunities for career advancement when working in the manufacturing industry."

Other factors that were found to be of significance in having a positive impact were having taken a manufacturing-related class and being of the male gender.

Interestingly, further analysis revealed, when controlling for all variables simultaneously, only a few emerged as good predictors of whether high schools students will choose a career in the manufacturing industry. Higher levels of students' agreement with the statement "working in the manufacturing industry is boring" were of significance in negatively impacting their likelihood of choosing a career in the manufacturing industry. Factors that were found to be of significance in having a positive impact were being of the male gender and students' indication that their friends had influenced their opinion of the manufacturing industry

Other analyses revealed students' indication that their immediate family and teachers had influenced their opinion of the manufacturing industry had a positive impact on the likelihood of them choosing a career in the manufacturing industry, as did their city, township, or village of residency. Students' perceptions of the level of college education needed to gain employment in the manufacturing industry, having a family member who works or previously worked in the manufacturing industry, and students' race were found not to have any significant level of impact on the likelihood of them choosing a career in the manufacturing industry.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to explore the influences of current manufacturing industry perceptions among high schools students in Macomb County, Michigan. Across Michigan, particularly in the southeastern region where Macomb County is located, the need for educated and skilled people to work in the manufacturing industry is growing rapidly, but qualified people are in short supply (MWDA, 2014; MDTMB, 2013). This shortage of human capital is being exacerbated by a lack of people with the desire or willingness to pursue careers in the manufacturing industry (MDTMB, 2013; Woolsey & Coxen, 2013). One of the most disconcerting characteristics of this shortage is an apparent lack of interest in manufacturing careers shared by young people. The view of the industry amongst this population is troublesome and paints a gloomy picture of manufacturing's future talent pool (AAR Corp., 2011; Giffi et al., 2015; Giffi & DeRocco, 2011; Hope Street Group, 2014; Knight, 2008; Morrison et al., 2011; Mourshed, et al., 2012). Giffi and DeRocco (2011) found "among 18-24 year-olds, manufacturing ranks dead last among industries in which they would choose to start their careers" (p. 3).

While several intrinsic and extrinsic factors have the potential to influence high school students' perceptions of manufacturing, the current body of literature includes very little data regarding young peoples' perceptions of careers in the manufacturing industry. Community colleges must understand the factors that influence future

workforce's perceptions of the manufacturing industry so they may support employers by facilitating the effective promotion of manufacturing programming and careers. In carrying out this study, the researcher wishes to address this gap in the literature and believes a better understanding of this phenomenon will enable all stakeholders—a group that encompasses community colleges—to work in partnership to recruit and educate future generations of manufacturing professionals and to develop an overall public awareness of the great opportunities presented by careers in the manufacturing industry.

Macomb County was chosen as the location for the study because it is currently experiencing a shortage of skilled manufacturing workers and constitutes the primary service area for Macomb Community College, the institution at which the researcher is employed. Data collection consisted of surveys of Macomb County high school students. Descriptive statistics and analysis of variance were used to determine the relationship between several environmental, economic, vocational, and educational factors and high school students' perceptions of the manufacturing industry, as well as the impact of their perceptions on the likelihood they will pursue a career in the manufacturing industry.

In seeking to understand this phenomenon, this study addressed the following questions: (1) Do high school students' perceptions of the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry? (2) What factors have the most influence on the likelihood high school students will choose a career in the manufacturing industry (3) What people have the most influence on the likelihood students will choose a career in the manufacturing industry? (4) Do high school students' perceptions of the level of college education needed to gain employment in the manufacturing industry impact the likelihood they will choose a career in the

manufacturing industry? (5) Does having a family member who works or previously worked in the manufacturing industry impact the likelihood high school students will choose a career in the manufacturing industry? (6) Does the city, township, or village of residency impact the likelihood high school students will choose a career in the manufacturing industry? (7) Does gender impact the likelihood high school students will choose a career in the manufacturing industry? (8) Does race impact the likelihood high school students will choose a career in the manufacturing industry?

Interpretation of Findings

The previous chapter presented the results from the eight research questions that are the foundation of this study. Analysis of these results enabled the researcher to draw several conclusions and recommendations for action and further research. What follows is a discussion of these conclusions based on the findings from each research question, also taking into consideration the literature reviewed in the second chapter of this study.

Research Question One, Conclusions

"Do high school students' perceptions of the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry?"

The findings from this research question suggest high school students' perceptions of the manufacturing industry do impact the likelihood they will choose a career in the manufacturing industry; however, the impact is markedly significant among students who are very unlikely to choose a career in the manufacturing industry. This finding bears consideration, especially when one considers 22.1% (n=217) of students reported they were "very unlikely" to choose a career in the manufacturing industry (Table 13).

A conclusion drawn from this finding is high school students who trend toward a negative perception of the manufacturing industry are highly unlikely to work in the manufacturing industry in the future. Much of the literature reviewed in preparation for this study pointed toward manufacturing's negative image problem. Correcting this image problem is a recently proclaimed objective of policymakers, manufacturers, and educators. Other literature reviewed (1) revealed parents often find themselves at a loss when it comes to providing career guidance to their children and (2) highlighted the power peoples' perceptions play in determining their future aspirations, including educational and career pathways. The researcher concludes a concerted effort between secondary and post-secondary educators, government, industry, and the community is needed to affect a positive impact on young peoples' perceptions of the modern manufacturing industry.

Research Question Two, Conclusions

"*What factors have the most influence on the likelihood high school students will choose a career in the manufacturing industry?"*

The findings from this research question suggest certain factors appear to have a greater influence than others on the likelihood high school students will choose a career in the manufacturing industry.

Individual analysis. Analyzed individually, higher levels of students' agreement with the following statements were found to be positively associated at a statistically significant level with the likelihood of them choosing a career in the manufacturing industry:

1. Working in the manufacturing industry pays well. (Most significant positive association during individual analysis)
2. A high level of technology is used by people who work in the manufacturing industry.
3. There are many opportunities for career advancement when working in the manufacturing industry.

Also when analyzed individually, taking a manufacturing-related class was of significance in positively impacting students' likelihood of choosing a career in the manufacturing industry.

Analyzed individually, higher levels of students' agreement with the following statements were found to be negatively associated at a statistically significant level with the likelihood of them choosing a career in the manufacturing industry:

1. Working in the manufacturing industry is boring. (Most significant negative association during individual analysis)
2. There is a high risk of on-the-job injury for people who work in the manufacturing industry.

Simultaneous analysis. Further analysis revealed, when examining all factors simultaneously, accounting for the effect of each predictor variable while the other predictor variables were controlled for, only students' ratings of the statement "working in the manufacturing industry is boring" was of significance. Higher levels of students' agreement with this statement were found to have a negative impact on their likelihood of choosing a career in the manufacturing industry.

Conclusions. Several conclusions can be drawn from these findings, some of which are to be expected. As rate of pay alone is often cited as one of the most important job consideration factors for any career — if not the most important — it is to be expected high levels of agreement with the statement *"working in the manufacturing industry pays well"* will have the most statistically significant impact on the likelihood young people *will* choose a career in the manufacturing industry. It is also to be expected, even without consideration of the industry, high levels of agreements with the statement *"there is a high risk of on-the-job injury for people who work in the manufacturing industry"* will have a statistically significant impact on the likelihood young people *will not* choose a career in the manufacturing industry. It is interesting to note, however, that the value of personal safety on the job was on the lower end of statistical significance in this study. It is reasonable to conclude that young people are less impressed by these longer-standing stereotypical images of manufacturing: Other stereotypes that fit this description *(i.e., "you get dirty," "facilities are dark,"* and *"you work on an assembly line"*) registered no statistical significance. The researcher concludes that pro-manufacturing efforts aimed at young people should place less emphasis on these factors. High school students appear to have gotten this point.

In an era flush with studies intended to understand what makes the Millennial Generation—to which the participants in this study belong—tick, finding agreement with the statement *"there are many opportunities for career advancement when working in the manufacturing industry"* to be statistically significant is interesting. Often labeled as lacking ambition, it is noteworthy to find this population, belonging to the generation in question, would be more apt to consider a job in manufacturing if they perceive

opportunities for career advancement are many. A study conducted by the Bentley University Center for Women and Business (2012) found "as they enter the workplace and begin assuming higher level work, Millennials seem to be less motivated by career advancement and more by personal values and aspirations" (para. 1). Conversely, other studies have found that Millennials not only value career advancement, but are impatient with the time it takes to progress in their careers (Lyons, Schweitzer, Eddy, & Kuron, 2012; PricewaterhouseCoopers, 2011). It is logical to conclude that the value high school students place on career advancement is impacted by what they observe among members of older generations in their periphery. Older generations worked in the now old-fashioned manufacturing industry, where career advancement was of high value but rare among the more menial jobs that were once quite plentiful within the industry. This adds fuel to one of the researcher's previous conclusions: High school students need to be educated on the breadth and depth of career opportunities available within the manufacturing industry.

Particularly among the Millennial Generation, it is no surprise that higher levels of agreement with the statement *"a high level of technology is used by people who work in the manufacturing industry"* were found to be statistically significant on the likelihood of high school students choosing a career in the manufacturing industry. It stands to reason that today's high school students place some level of value on a career that incorporates high technology. According to PricewaterhouseCoopers (2011) "Millennials' use of technology clearly sets them apart. One of the defining characteristics of the millennial generation is their affinity with the digital world" (p. 3). It is reasonable to conclude that high school students believe working amid high

technology is an important factor in choosing a career. This is encouraging. One of the factors that contributed to the manufacturing skills gap is the increasingly technical environment that characterizes working in the industry. People who are interested in working in the modern manufacturing industry need to be knowledgeable about technology to be successful. To many generations, this is a foreign and sometimes scary notion. A population with a high ability to adapt to this environment and develop these skills is entering the workforce.

Higher levels of agreement with the statement *"working in the manufacturing industry is boring"* was found to be the second most statistically significant factor impacting the likelihood of students choosing a career in the manufacturing industry during individual analysis. Moreover, during simultaneous analysis, it emerged as the only statistically significant factor. The more students agree with this statement, the less likely they are to choose a career in the manufacturing industry. This means that this population, belonging to a generation that is often tagged as lazy, wants to be engaged at work. For example, a study conducted by the Pew Research Center (2013) found "Millennials stand out in the importance they place on having a job that they enjoy doing" (p. 41). Approximately half responded that "doing work they enjoy is 'extremely important' to them" (p. 41). The findings from this statement are related to the previously discussed *"high technology"* findings, but are even more important within the context of attracting high school students to careers in the manufacturing industry. This is a generation that grew up in an environment characterized by constant stimulation. This is even more influential than a high rate of pay; they crave a stimulating environment and its presence within the career they choose is of high importance to them.

The researcher concludes that pro-manufacturing efforts aimed at young people should place greater emphasis on the high technology and interesting work that characterizes the modern manufacturing industry.

Research Question Three, Conclusions

"What people have the most influence on the likelihood students will choose a career in the manufacturing industry?"

The findings from this research question suggest high school students' perceived influence of their friends, immediate family members, and teachers have over their opinion of the manufacturing industry has some level of impact on the likelihood they will choose a career in the manufacturing industry.

Individual analysis. Analyzed individually, students' indication that their friends, immediate family members, and teachers had influenced their opinion of the manufacturing industry had a positive impact on the likelihood of them choosing a career in the manufacturing industry. Friends' influence was of most significance, followed by immediate family members' influence, and teachers' influence.

Simultaneous analysis. Further analysis revealed, when examining all factors simultaneously, accounting for the effect of each predictor variable while the other predictor variables were controlled for, only students' indication that their friends had influenced their opinion of the manufacturing industry had a statistically significant impact on the likelihood they will choose a career in the manufacturing industry.

Conclusions. It is interesting to note that students' perceived influence of their friends over their opinion of the manufacturing industry has the most statistical significance. The more a student believes her friends have influenced her opinion of the

manufacturing industry, the more likely she is to choose a career in the industry. Although not specific to any industry, the literature review revealed that parents had the greatest influence on young peoples' career choices. It also revealed that teachers have a significant level of influence in this arena, but studies that also incorporated friends' influence revealed that this group was not influential. It is possible that these studies did not give apt consideration to the power of the cohort factor among young people. Regardless, the interpretation of this finding is somewhat problematic. One interpretation is that while young people are still open to the influence of family and teachers, they are becoming increasingly reliant on the opinions of those who are on their level. Parents being busy and more frequently away from home, reduced availability of manufacturing classes in high schools, and social networking are factors that could contribute to this interpretation. Another interpretation takes into account the level of exposure students friends' have had to the manufacturing industry. The industry has been so impactful on the residents of Macomb County, it is distinctly possible that students' friends' have had greater and more positive exposure, via family members and personal experiences, than they themselves have encountered. The researcher concludes that, while the adults in high school students' lives are still influential to a degree, this is a population of independent thinkers. Pro-manufacturing messages aimed at young people should be predominantly tailored to speak to them directly, rather than their adult influencers.

Research Question Four, Conclusions

"Do high school students' perceptions of the level of college education needed to gain employment in the manufacturing industry impact the likelihood they will choose a career in the manufacturing industry?"

The findings from this research question suggest high school students' perceptions of the level of college education needed to gain employment in the manufacturing industry does not have a significant impact on the likelihood they will choose a career in the manufacturing industry. A conclusion drawn from this finding is obvious: Students do not give much consideration to the level of post-secondary education required to get a job in the manufacturing industry, regardless of whether they consider a career in the industry as an option. Because much of the current discussion surrounding the manufacturing skills gap focuses on the level of post-secondary education required to enter the industry, this finding becomes especially significant. Apropos of this discussion, methods that can be used to "up-sell" careers in the industry to young people are a common component of many general discussions regarding the current state of the manufacturing industry; a popular up-selling theme regards the level of post-secondary education needed to enter the industry. The findings from this research question reveal—in the context of this study—these discussions and related up-selling efforts about post-secondary education have had no significant impact on the desire of young people to pursue a career in the manufacturing industry.

This lack of impact could also be due to the inconsistency of the messages being sent regarding post-secondary education and the manufacturing industry (*e.g.,* "some level of post-secondary credential is necessary to get a job in the modern manufacturing industry," "minimal, if any, post-secondary education is necessary to get a job in the manufacturing industry"). Sending inconsistent messages about educational requirements to young people and their parents could prove to be counterproductive to the effort to draw young people to the industry. The researcher concludes stakeholders

must find a better way to outline the breadth and depth of occupational pathways within the manufacturing industry and the post-secondary education necessary to follow each pathway.

Research Question Five, Conclusions

"Does having a family member who works or previously worked in the manufacturing industry impact the likelihood high school students will choose a career in the manufacturing industry?"

The findings from this research question suggest having a family member who works or previously worked in the manufacturing industry is not a significant factor on the likelihood of high school students choosing a career in the manufacturing industry. This is of interest because much of the discussion and speculation about the sparse availability of people qualified to fill the skills gap in Macomb County points to the influence of family members who have had a bad employment experience in the industry (Walsh, 2012). This conjecture is based on the belief that family members who previously worked in the industry were ousted from their jobs during the Great Recession and are now distrustful of the industry and no longer willing to be a part of the available manufacturing labor force. Thus, they would act as a deterrent in the lives of young people who may consider a career in the manufacturing industry. The researcher concludes that, regardless of whether family members have had good or bad employment experiences in the manufacturing industry, this is an autonomous population of high school students that is not likely to base their choices on the experiences of family members.

Research Question Six, Conclusions

"Does the city, township, or village of residency impact the likelihood high school students will choose a career in the manufacturing industry?"

The findings from this research question suggest high school students' city, township, or village of residency does have an impact on the likelihood they will choose a career in the manufacturing industry. Admittedly, the premise for asking this question is not based on previous research or assumptions expressed in the literature. It is narrowly specific to a phenomenon that afflicts Macomb County and is dependent on an association with the stereotypical belief that the manufacturing industry does not pay well. The phenomenon that afflicts Macomb County is that of income disparity. According to Macomb Community College President Jim Jacobs (as cited in Walsh, 2015) "clearly, there is a considerable difference, economically, between the northern end and the southern end of the county" (para. 45). Because southern Macomb County communities make less money than northern Macomb County communities, the researcher's expectation was that southern high school students would be more likely to choose a career in the manufacturing industry than northern high school students.

Table 47 illustrates the mean distribution of likelihood of choosing a career in the manufacturing industry grouped by southern and northern communities. It reveals that, overall, high school students residing in southern Macomb County communities are more likely to choose a career in manufacturing than those residing in northern communities; however, there are several issues with this conclusion:

1. The number of southern school districts that agreed to participate in this study far outweighed the number of northern school districts that agreed to participate.

2. The numbers of students residing in each community are unequal.
3. The southern school districts have a greater number of manufacturing-related classes to offer students. (Anecdotally, Fraser High School is known to have a very strong welding program; high school students residing in Fraser are by far most likely to choose a career in the manufacturing industry. It is important to note, however, that this city also had the smallest number of participants.)

Table 47. *Mean Distribution, Research Question Six, Grouped by Southern & Northern Macomb County Communities*

City, Township, or Village of Residency	N	Mean
Southern Macomb County Communities		
Fraser	11	4.64
Center Line	56	3.61
Eastpointe	48	3.13
Warren	175	3.11
Clinton Township	130	3.06
Mount Clemens	110	2.95
Roseville	22	2.91
St Clair Shores	91	2.57
Sterling Heights	45	2.36
Northern Macomb County Communities		
New Haven	38	2.87
Lenox Township	13	2.85
Richmond	54	2.81
Macomb Township	70	2.71

Therefore, the researcher concludes that the methodology and data are not strong enough to suggest that students residing in southern Macomb County communities are more likely to choose a career in the manufacturing industry than those residing in northern communities.

Research Question Seven, Conclusions

"Does gender impact the likelihood high school students will choose a career in the manufacturing industry?"

The findings from this research question suggest gender is a very significant factor on the likelihood of high school students choosing a career in the manufacturing industry. Given the gender disparity that characterizes the manufacturing industry—it is very predominantly male—this is to be expected. Just as men do not traditionally pursue careers in fields associated with female roles, such as nursing, women do not traditionally pursue careers in fields associated with male roles. This holds true for manufacturing today. The researcher concludes that, while a strong pro-manufacturing effort aimed at high school students as a whole is necessary, a unique effort tailored to female high school students should be a priority. This effort is not intended to specifically exclude male students, but to break down gender roles associated with manufacturing and educate females on opportunities available to them within the industry.

Research Question Eight, Conclusions

"Does race impact the likelihood high school students will choose a career in the manufacturing industry?"

The findings from this research question suggest race is not a factor in determining whether high school students will choose a career in the manufacturing industry. A conclusion drawn from this finding is the relationship between ethnicity and culture and vocational choice is not of significance within the context of this study. The researcher concludes that pro-manufacturing efforts aimed at high school students do not need to be tailored to race.

Limitations and Delimitations

This study was bound by certain limitations and delimitations. This study was delimited to students attending high school in Macomb County, Michigan. A particular

limitation of this was that some high schools chose not to participate in the survey, either through outright refusal or by not responding to multiple invitations to participate from the researcher. A form of nonprobability sampling—convenience sampling—was used. Of the high schools that accepted the invitation to participate in the study, the principals or their designee determined which classes of students would be administered the survey. Therefore, this study could be critiqued as being subject to limited, if any, generalizations; however, the researcher contends that the ability to make generalizations was not the overarching objective of this study. Regardless, generalizations to other regions could be made with care. Cautious generalizations to analogous populations could be appropriate to make.

The researcher carried out a comprehensive search of current literature and found no similar cases that addressed the subject of this study. Additionally, no existing data collection instruments were found to be appropriate for this study; therefore all data used in this study were collected through a survey instrument designed by the researcher. Having no available studies to benchmark against and no previously approved data collection instrument to be utilized posed many challenges to contend with, but the researcher considers this study to be one that can lead the way and provide a measure of guidance for similar studies that may be conducted on this topic in the future.

It is also important to consider that this study was carried out at a single point in time, whereas the factors that influence high school students' perception of the manufacturing industry may fluctuate over time, based on the consideration of several environmental, economic, vocational, and educational persuasions.

Recommendations for Action

Based on the analysis, findings, and conclusions drawn from this study, the researcher makes the following recommendations to community colleges in their mission to support employers by facilitating the effective promotion of manufacturing programming and careers: (1) in collaboration with high schools, provide opportunities for students to experience manufacturing classes, and (2) in collaboration with employers, establish career exploration opportunities and pathways.

This study provided insight on the factors that influence high school students' perceptions of the manufacturing industry. These insights also revealed that the generation to which these high school students belong tends to be more autonomous when compared with those that preceded it. As one Macomb County high school student parent framed it, "they don't really answer to anyone and get away with so much. They don't seem to heed adult advice at all" (D. Victory, personal communication, June 7, 2015). This revelation is important to consider within the context of all recommendations for action.

One way that community colleges can support employers by facilitating the effective promotion of manufacturing programming and careers is through collaboration with high schools to provide opportunities for students to experience manufacturing classes. These collaborations must be more meaningful than an articulation agreement. One of the principal ways high school students were traditionally exposed to the manufacturing industry was through vocational educational programs offered by the high schools. For a variety of reasons, some of these programs have been consolidated or, in most cases, shut down altogether. Even given the sparse offerings in Macomb County

high schools today, taking a manufacturing-related class had a statistically significant impact on the likelihood that students will choose a career in the manufacturing industry. Students need to be educated about the industry. While one of the best ways to do that is to directly expose them to it, resources are limited in education today, secondary and post-secondary schools included. These institutions must work together by pooling resources and sharing expenses to allow this exposure to happen. Many post-secondary institutions have strong manufacturing programs already in place. Most of these classes take place in the evenings, making the facilities available for daytime use. This is an ideal scenario for a dual-enrollment manufacturing program. Genuine collaborative efforts to interest high school students in manufacturing, leveraging the influential factors revealed in this study will be needed to gain enrollment in such a program. This type of dual enrollment model provides young people with skill sets relevant to the local job market and increases high school graduation as well as post-secondary enrollment rates (Le & Frankfort, 2011).

Another recommendation for community colleges is to establish career exploration opportunities and pathways in collaboration with employers. This means more than working together to develop courses and programs to address current industry needs. Direct exposure to the work that is done in the modern manufacturing industry will foster student interest. Employers are in need of employees, and they are especially interested in hiring people who will be long-term employees. This does not necessarily mean employers are only hiring *qualified* people to be long-term employees; employer investment in apprenticeship programs is an example of this. What employers need to consider, and community colleges need to help facilitate, is offering short-term

employment opportunities to young people who are interested in a career in manufacturing, but desire the direct experience without signing on up front for a long-term commitment. This model could be an optional extension, or elective, of a dual-enrollment manufacturing program, or an independent co-op model, designed to allow students to earn college credit and simultaneously give them real life work experience to include as they explore career opportunities and build their résumés. Employers need to engage young people much earlier on in their education-to-employment journey. Employers realize greater success in attracting the quality employees they require when they routinely connect with educators and youth, offering them experience with the opportunity to learn skills and earn money (Mourshed, et al., 2012).

Recommendations for Further Research

This study analyzed the relationship between factors that influence Macomb County, Michigan, high school students' perception of the manufacturing industry and the likelihood they will choose a career in the manufacturing industry. It also sought to determine which factors were most influential on their perception. This study could be conducted in different regions where the manufacturing industry is prominent and the manpower affliction is similar to that of Macomb County. While this study could be generalized with care to similar regions, different idiosyncrasies could emerge as important factors to consider within the context of comparable scenarios in other regions. A case study approach is another consideration for further research. A single high school population could be studied using a pre-intervention/post-intervention design (*e.g.,* survey high school students on their perception of manufacturing, treat them with a manufacturing education intervention, survey them again, and compare results). It also

would be interesting to develop a pilot dual-enrollment program and follow the students as they progress through it.

This study found that high school students who trend toward a negative perception of the manufacturing industry are highly unlikely to work in the manufacturing industry in the future. This study also revealed the impact of certain factors over high school students' perceptions of the manufacturing industry emerge as being more influential than others. Given that this was a study that, as far as could be ascertained, is the first of its kind, it is certainly possible there are additional factors that should be considered. For example, using a mixed methods approach, integrating qualitative methods such as interviews, could provide more detailed accounts from students that would allow the researcher to hone in on additional factors to be considered within the use of quantitative methods. Furthermore, the use of random probability sampling could result in a more representative student profile.

Finally, it is again important to consider that this study was carried out at a single point in time. It is likely high school students' perceptions of the manufacturing industry and the factors that influence their perceptions will vary over time. A longitudinal study would be necessary to study and measure this phenomenon.

Conclusion

The researcher's primary concerns in carrying out this study were to explore the influences of current manufacturing industry perceptions among high schools students in Macomb County, Michigan, and ascertain the likelihood they will pursue a career in manufacturing. This study found that high school students who have a more negative perception of the manufacturing industry are very unlikely to work in the manufacturing

industry in the future and also revealed that the impact of certain factors over their perceptions stand out as being more influential than others.

Having a negative impact on students' likelihood of pursuing a career in the manufacturing industry were higher levels of agreement with the following statements: (1) *"working in the manufacturing industry is boring,"* and (2) *"there is a high risk of on-the-job injury for people who work in the manufacturing industry."* On the other side, having a positive impact were higher levels of agreement with the following statements: (1) *"working in the manufacturing industry pays well,"* (2) *"a high level of technology is used by people who work in the manufacturing industry,"* and (3) *"there are many opportunities for career advancement when working in the manufacturing industry."* Other factors that were found to be of significance in having a positive impact were having taken a manufacturing-related class and being of the male gender. Other analyses revealed students' indication that their immediate family and teachers had influenced their opinion of the manufacturing industry had a positive impact on the likelihood of them choosing a career in the manufacturing industry, as did their city, township, or village of residency.

When controlling for all variables simultaneously, few factors stood out as the strongest predictors of whether high schools students will choose a career in the manufacturing industry. Higher levels of students' agreement with the statement *"working in the manufacturing industry is boring"* were of significance in negatively impacting their likelihood of choosing a career in the manufacturing industry. Factors that were found to be of significance in having a positive impact were being of the male

gender and students' indication that their friends had influenced their opinion of the manufacturing industry.

Collaborative efforts between secondary and post-secondary educators, government, industry, and the community are necessary to bring about a positive change on young peoples' perceptions of the modern manufacturing industry. Not making these efforts contributes to the ineffectiveness of vocational guidance methods, by allowing young people to go largely uninformed on the blossoming career opportunities available to them within this sector. Given the results of this study, and the known personality traits of the Millennial Generation, these efforts should highly emphasize the high technology and engaging work that characterizes the modern manufacturing industry. Perhaps more importantly, the autonomous nature of this generation will be more responsive to messages tailored to speak to them directly, not their adult influencers. Also, the gender bias rampant in the traditional manufacturing industry appears to hold true within this group of students as well. Unique efforts tailored to female high school students should be prioritized, not to exclude male students, but to break down gender roles associated with manufacturing and educate females on opportunities available to them within the industry.

According to Jacobs (2009), "if there is one common mission identified with community colleges, it is workforce education: the ability of these colleges to provide courses and programs that prepare students for work or for advancement within their present jobs" (p. 109). It is true: Community colleges are well positioned to prepare the manufacturing industry workforce and close the skills gap. In their mission to support employers by facilitating the effective promotion of manufacturing programming and

careers, community colleges must be assertive in their efforts to collaborate with high schools to provide opportunities for students to experience manufacturing classes and collaborate with employers to establish career exploration opportunities and pathways. These elements are essential to addressing the skills gap that continues to afflict the manufacturing industry.

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APPENDIX

A: Parental Consent Form

Parental consent

Dear Parent:

Our school will be participating in a survey conducted by Ms Vikki Gordon from Macomb Community College. Ms Gordon is a student in the Doctorate in Community College Leadership program at Ferris State University. The survey will contribute to the completion of Ms Gordon's dissertation for the Ferris program. The purpose of the survey is to examine high school students' perceptions of the manufacturing industry.

The survey will be administered online in a school-based computer laboratory during the week of September 29, 2014. The exact date will be selected by the principal of your child's school. The survey will take approximately 20 minutes to complete. The survey is anonymous and voluntary. It has been designed to protect your child's privacy. There will be no identifying information on the survey. No student will ever be mentioned by name in a report of the results.

Your child will get no immediate benefit from taking part in the survey. However, the results of the survey will help children in the future to the extent that they will become more aware of the manufacturing industry and related college degree and career opportunities. **If for any reason you do not wish your son or daughter to participate in the survey, please sign this form and return it by September 19, 2014.**

_____

Student's name (please print)

_____

Parent's signature Date

APPENDIX

B: Overview of the Study

Overview of Study: An analysis of the perceptions of the manufacturing industry among high school students in Macomb County, Michigan

Student researcher	Vikki Gordon
Institutional information	Ferris State University Doctorate in Community College Leadership (EdD)
Employment	Apprentice Coordinator Department of Applied Technology & Apprenticeship Macomb Community College
Contact information	586-445-7519 gordonv@macomb.edu

The manufacturing industry in Michigan has undergone a dramatic transformation over the last 20 years. Traditionally, a job in manufacturing meant working on the line and required no more than a high school diploma. Today, jobs in manufacturing are careers characterized by high technology and require some level of post-secondary education. Across Michigan, particularly in the metropolitan Detroit area, the need for educated and skilled manufacturing technicians is growing at a rapid pace; however, many young people have an outdated perception of the manufacturing industry. These perceptions are affecting area manufacturers—who are struggling to find qualified employees—as well as enrollment in the manufacturing programs at the community college, which reflects an absence of young people pursuing these careers. To examine these perceptions in more depth, this researcher plans to use a survey of high school students in Macomb County, Michigan. The researcher will analyze the relationship between a variety of factors (environmental, economic, vocational, educational), students' perceptions of the manufacturing industry, and the likelihood that they will pursue a career in the manufacturing industry.

Vikki Gordon • Doctorate in Community College Leadership • Ferris State University

APPENDIX

C: SURVEY

Thank you for agreeing to participate in this survey. This is a survey about manufacturing. It will be used for a study on what high school students in Macomb County think of the manufacturing industry.

For this survey, the "manufacturing industry" means the business of creating all types of consumer products and "working in the industry" means any job that has a direct hand in the creation of products. For example, an accountant who works for a company in the manufacturing industry does not have a direct hand in the creation of products and for this study would not be considered someone who works in the manufacturing industry. Your responses will be anonymous and confidential.

Please tell us your level of agreement or disagreement with the following statements:

1. Working in the manufacturing industry is physically demanding.

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

2. Working in the manufacturing industry pays well.

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

3. Working in the manufacturing industry is boring.

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

4. A high level of technology is used by people who work in the manufacturing industry.

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

5. You get dirty when you work in the manufacturing industry.

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

6. There is a high risk of on-the-job injury for people who work in the manufacturing industry.

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

7. Facilities in the manufacturing industry are dark.

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

8. There are many opportunities for career advancement when working in the manufacturing industry.

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

9. Few women work in the manufacturing industry.

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

10. Working in the manufacturing industry means you have to work on an assembly line.

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

11. How likely are you to choose a career in the manufacturing industry?

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

12. Please use the following scale to rate how much college education you think is needed to work in the manufacturing industry:

Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
☐	☐	☐	☐	☐	☐

13. Have you ever taken any manufacturing-related classes (Machine Tool; Welding; Drafting; or Mechatronics for example)?

☐ No	☐ Yes. Describe the Courses:

Do any of the following people **currently** work in the manufacturing industry?			
14. Your immediate family (mother, father, sister, brother, and/or grandparent)	Yes ☐	No ☐	Don't know ☐
15. Your extended family (aunt, uncle, and/or cousin)	Yes ☐	No ☐	Don't know ☐

Have any of the following people **previously** worked in the manufacturing industry?			
16. Your immediate family (mother, father, sister, brother, and/or grandparent)	Yes ☐	No ☐	Don't know ☐
17. Your extended family (aunt, uncle, and/or cousin)	Yes ☐	No ☐	Don't know ☐

How much do you think the following people have influenced your opinion of the manufacturing industry?				
18. Your friends	Not at all ☐	A little ☐	Some ☐	A lot ☐
19. Your immediate family (mother, father, sister, brother, and/or grandparent)	Not at all ☐	A little ☐	Some ☐	A lot ☐
20. Your extended family (aunt, uncle, and/or cousin)	Not at all ☐	A little ☐	Some ☐	A lot ☐
21. Your teachers	Not at all ☐	A little ☐	Some ☐	A lot ☐
22. Other school staff members (counselors, advisors, coaches)	Not at all ☐	A little ☐	Some ☐	A lot ☐

23. How much do you think the mass media, such as television, the internet, and radio have influenced your opinion of the manufacturing industry?	Not at all ☐	A little ☐	Some ☐	A lot ☐

24. What person in your life has had the most influence on your opinion of the manufacturing industry?

25. What city, township, or village do you live in?

26. Which high school do you go to?

27. What grade are you in?

9	10	11	12	Other
☐	☐	☐	☐	☐

28. How old are you?

13	14	15	16	17	18	19+
☐	☐	☐	☐	☐	☐	☐

29. What is your gender?

Female	Male
☐	☐

30. Which of the following most accurately describes your race?

African American	Asian/Pacific Islander	Hispanic	Native American	White, non-Hispanic	Other
☐	☐	☐	☐	☐	☐

If you have any questions or concerns about your rights as a subject in this study, please contact: Ferris State University Institutional Review Board (IRB) for Human Participants, 1201 S. State St.- CSS 310, Big Rapids, MI 49307, (231) 591-2553, IRB@ferris.edu

APPENDIX

D: INSTRUCTIONS FOR FACULTY FACILITATORS

Instructions to be read to students prior to survey administration

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You are invited to participate in a survey conducted by Ms Vikki Gordon, Apprentice Coordinator at Macomb Community College. Ms Gordon is a student in the Doctorate in Community College Leadership program at Ferris State University. The survey will contribute to the completion of Ms Gordon's dissertation for the Ferris program. The intent of Ms Gordon's dissertation is to learn what high school students in Macomb County, Michigan, think of the manufacturing industry. Manufacturers across the metropolitan Detroit region are reporting severe shortages of qualified workers, but it is of particular importance in Macomb County, where manufacturing is one of the most prominent drivers of our economy.

Your participation in this survey is entirely voluntary and you may quit the survey at any time. Your responses will be anonymous and confidential.

APPENDIX

E: FOLLOW-UP EMAIL, MACA REPRESENTATIVES

Follow-Up - High School Student Survey - Manufacturing Industry

October 26, 2014

Dear [Name],

My name is Vikki Gordon. I made a brief presentation at your MACA meeting at the MISD on October 15. Just a quick refresher on that presentation:

- I am a student in the Doctorate in Community College Leadership program at Ferris State University.
- I am also the Apprentice Coordinator at Macomb Community College.
- I am requesting your help to administer a survey that will contribute to the completion of my dissertation for the Ferris program.
- The intent of my dissertation is to learn what high school students in Macomb County think of the manufacturing industry.
- To examine this in more depth, I plan to use a survey with which I will analyze the relationship between students' perceptions of the manufacturing industry; a variety of environmental, economic, vocational and educational factors; and the likelihood that they will choose a career in the manufacturing industry.

As you know, manufacturers across the metropolitan Detroit region are reporting severe shortages of qualified workers, but it is of particular importance in Macomb County, where manufacturing is one of the most prominent drivers of our economy. This study will not only benefit educators and students, but the County as a whole.

I know how busy you are. If you prefer, I am very happy to discuss this directly with your high school principals. For your convenience, I have attached all the documents that I passed out on October 15. I am asking you to please follow up with me by Friday, October 31, on your willingness to assist me with including the [name of district] in this study.

Thank you,

Vikki Gordon
Apprentice Coordinator
Macomb Community College
14500 E 12 Mile Road
Warren MI 48088
586-445-7519

APPENDIX

F: EMAIL INVITATION, HIGH SCHOOL PRINCIPALS

Request for Assistance - High School Student Survey - Manufacturing Industry

October 29, 2014

Dear [Name],

My name is Vikki Gordon. I am a student in the Doctorate in Community College Leadership program at Ferris State University. I am also the Apprentice Coordinator at Macomb Community College. I am requesting your help to administer a survey that will contribute to the completion of my dissertation for the Ferris program. The intent of my dissertation is to learn what high school students in Macomb County think of the manufacturing industry. To examine this in more depth, I plan to use a survey with which I will analyze the relationship between students' perceptions of the manufacturing industry; a variety of environmental, economic, vocational and educational factors; and the likelihood that they will choose a career in the manufacturing industry. Dr. Judy Pritchett has been assisting me and supporting me in this venture.

As you know, manufacturers across the metropolitan Detroit region are reporting severe shortages of qualified workers, but it is of particular importance in Macomb County, where manufacturing is one of the most prominent drivers of our economy. This study will not only benefit educators and students, but the County as a whole. I have attached a few documents:

- The survey for your review (this can be administered to students online or by using a paper copy; whatever works best and is most convenient for your school)
- A brief overview of the purpose of my study
- The parental consent form (it's an opt-out consent)
- An introduction for instructors (or whoever will administer the survey) to read to students prior to administering the survey

I am asking you to please follow up with me by Friday, October 31, on your willingness to assist me with including [name of high school] in this study. If you would prefer that I contact someone else at your High School, please let me know.

Thank you very much for your consideration.

Vikki Gordon
Apprentice Coordinator
Macomb Community College
14500 E 12 Mile Road
Warren MI 48088
586-445-7519

APPENDIX

G: EMAIL INVITATION, HS PRINCIPALS OF MACA ATTENDEES

Request for Assistance HS Mfg Survey

November 10, 2014

Dear [Name],

My name is Vikki Gordon. I am a student in the Doctorate in Community College Leadership program at Ferris State University. I am also the Apprentice Coordinator at Macomb Community College. I am requesting your help to administer a survey that will contribute to the completion of my dissertation for the Ferris program. The intent of my dissertation is to learn what high school students in Macomb County think of the manufacturing industry. To examine this in more depth, I plan to use a survey with which I will analyze the relationship between students' perceptions of the manufacturing industry; a variety of environmental, economic, vocational and educational factors; and the likelihood that they will choose a career in the manufacturing industry. Dr. Judy Pritchett has been assisting me and supporting me in this venture. I presented this information at the MACA meeting at the MISD last month.

As you know, manufacturers across the metropolitan Detroit region are reporting severe shortages of qualified workers, but it is of particular importance in Macomb County, where manufacturing is one of the most prominent drivers of our economy. This study will not only benefit educators and students, but the County as a whole. I have attached a few documents:

- The survey (This can be administered to students using the attached as a paper copy or online; whatever works best and is most convenient for your school. If you would like to use the paper survey, I will be happy to make copies and bring them to you. If you would rather it be administered online, please let me know and I will email you the link.)
- A brief overview of the purpose of my study
- An introduction for instructors (or whoever will administer the survey) to read to students prior to administering the survey
- The parental consent form (it's an opt-out consent)

I would like to have the surveys completed by Friday, November 21, but that's not a hard deadline. In general, I am looking for 30 participants from every high school in the county, but there is no limit to the number I will take.

I am asking you to please follow up with me at your earliest convenience on your willingness to assist me with including your [name of high school] in this study.

Thank you very much for your consideration.

Vikki Gordon
Apprentice Coordinator
Macomb Community College
14500 E 12 Mile Road
Warren MI 48088
586-445-7519

APPENDIX

H: EMAIL INVITATION, HS PRINCIPALS OF NON-MACA ATTENDEES

Request for Assistance - High School Student Survey - Manufacturing Industry

October 27, 2014

Dear [Name],

My name is Vikki Gordon. I am a student in the Doctorate in Community College Leadership program at Ferris State University. I am also the Apprentice Coordinator at Macomb Community College. I am requesting your help to administer a survey that will contribute to the completion of my dissertation for the Ferris program. The intent of my dissertation is to learn what high school students in Macomb County think of the manufacturing industry. To examine this in more depth, I plan to use a survey with which I will analyze the relationship between students' perceptions of the manufacturing industry; a variety of environmental, economic, vocational and educational factors; and the likelihood that they will choose a career in the manufacturing industry. Dr. Judy Pritchett has been assisting me and supporting me in this venture.

As you know, manufacturers across the metropolitan Detroit region are reporting severe shortages of qualified workers, but it is of particular importance in Macomb County, where manufacturing is one of the most prominent drivers of our economy. This study will not only benefit educators and students, but the County as a whole. I have attached a few documents:

- The survey (this can be administered to students online or by using a paper copy; whatever works best and is most convenient for your school)
- A brief overview of the purpose of my study
- The parental consent form (it's an opt-out consent)
- An introduction for instructors to read to students prior to administering the survey

I am not targeting any specific group of students, just high school students in Macomb County (grades 9-12). Ideally, I would like to get 20-30 students per high school in Macomb County for a total of 500-600 responses for the study. That being said, I know that high schools are extremely busy and trying to accommodate something like this is a fairly low priority, so I will take what I can get. I will do whatever I need to do to get the data, electronically or by way of a paper survey, and could personally come to any classes you can spare the time to include if that makes it easier.

Can you please assist me with including [name of high school] in this study?

Vikki Gordon
Apprentice Coordinator
Macomb Community College
14500 E 12 Mile Road
Warren MI 48088
586-445-7519

APPENDIX

I: FOLLOW-UP EMAIL INVITATION, ALL PRINCIPALS

November 17, 2014

Dear [Name],

My name is Vikki Gordon. I am the Apprentice Coordinator at Macomb Community College and a student in the Doctorate in Community College Leadership program at Ferris State University. I am writing to ask for your help to include your students in a survey that will contribute to the completion of my dissertation for the Ferris program.

The intent of my dissertation is to learn what Macomb County high school students think of the manufacturing industry. To examine this, I am using a survey to analyze the relationship between students' perceptions of the industry; a variety of environmental, economic, vocational and educational factors; and the likelihood that they will choose a career in the manufacturing industry.

My target population is broad: Any high school student, grades 9 through 12 in Macomb County. I am looking for 30 participants from every high school in the county, but there is no limit to the number I will take. I have attached a few documents:

- The survey. This can be administered to students using the attached as a paper copy or online, whatever works best and is most convenient for your school and your students. If you would like to use the paper survey, I will be happy to make copies and bring them to you. If you would rather it be administered online, please let me know and I will email you the link.
- A brief overview of the purpose of my study.
- An introduction for instructors (or whoever will administer the survey) to read to students prior to administering the survey.
- The parental consent form (it's an opt-out consent)

As you know, manufacturers across the metropolitan Detroit region are reporting severe shortages of qualified workers, but it is of particular importance in Macomb County, where manufacturing is one of the most prominent drivers of our economy. This study will not only benefit educators and students, but the County as a whole.

I would like to have the surveys completed by Friday, December 12. I would very much like to include [name of high school] in the study. Please follow up with me at your earliest convenience.

Thank you very much for your consideration!

Vikki Gordon
Apprentice Coordinator
Macomb Community College
14500 E 12 Mile Road
Warren MI 48088
586-445-7519

APPENDIX

J: MAILED INVITATION, FOLLOW-UP, ALL HS PRINCIPALS

November 24, 2014

Dear [Name],

My name is Vikki Gordon. I am the Apprentice Coordinator at Macomb Community College and a student in the Doctorate of Education in Community College Leadership program at Ferris State University. I am writing to ask for your assistance in including your school in a survey that will contribute to the completion of my dissertation for the Ferris program.

The intent of my dissertation project is to learn what Macomb County high school students think of the manufacturing industry. To examine this, I am using a survey to analyze the relationship between students' perceptions of the industry; a variety of environmental, economic, vocational and educational factors; and the likelihood that they will choose a career in the manufacturing industry.

My target population is broad: Any high school student in grades 9 through 12 in Macomb County. I am hoping for 25-30 participants from every high school in the county, but there is no limit to the number I will include in the study. I have enclosed the following in this mailing:

- The survey—25 copies. I also have an electronic version which students can complete online. The survey can be administered either way, whatever is most convenient for your school and your students. If you would like to use the online survey, please email me and I will forward you the link.
- An introduction for instructors to read to students prior to administering the survey—5 copies.
- The parental consent form—25 copies (it's an opt-out consent).

As you know, manufacturers across the metropolitan Detroit region are reporting severe shortages of qualified employees, but it is of particular importance in Macomb County, where manufacturing is one of the most prominent drivers of our economy. This study will not only benefit educators and students, but the County as a whole.

I would like to have the surveys completed no later than Friday, December 19, 2014. For your convenience, I have included a prepaid self-addressed envelope to be used to return the surveys. I would very much like to include [name of high school] in this study. Please feel free to call me at 586-445-7519 or email me at gordonv@macomb.edu if you have any questions.

Thank you very much for your consideration.

Vikki Gordon
Apprentice Coordinator

APPENDIX

K: EMAILED FOLLOW-UP TO MAILED INVITATION

Macomb High School Student Manufacturing Industry Survey

November 17, 2014

Dear [Name],

I hope you had a wonderful Thanksgiving holiday. I am writing to follow-up on a mailing I sent out the week of November 24. You should have received it just before or just after the Thanksgiving break.

As a refresher, my name is Vikki Gordon. I am the Apprentice Coordinator at Macomb Community College and an EdD student at Ferris State University. The intent of my dissertation project for my EdD program is to learn what Macomb County high school students think of the manufacturing industry. The mailing I sent out included a letter explaining this in more detail as well as a package of 25 surveys complete with a self-addressed prepaid envelope to return the surveys to me at the College.

I know that your high school is very busy, and requesting that instructors and students take time out for a survey is asking a lot. Please know that I would be forever grateful if you could spare the time to have 25 of your students participate in the survey. The study for which the survey will be used will not only benefit educators and students, but Macomb County as a whole.

If you have any questions or concerns about the survey or the study, please do not hesitate to contact me.

Thank you for your time and have a great day.

Vikki Gordon
Apprentice Coordinator
Macomb Community College
14500 E 12 Mile Road
Warren MI 48088
586-445-7519

APPENDIX

L: IRB APPROVAL, Ferris State University

(NEED TO INSERT A COPY OF THE APPROVAL LETTER YOU RECEIVED FROM IRB)