

Understanding the Attitudes of Incumbent Manufacturing Workers  
toward Training Opportunities

by

Lakshmi Amrutha Killada

B.Tech. Jawaharlal Nehru Technological University Kakinada, 2015

M.B.A. Babson College, 2019

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Signature of Author: \_\_\_\_\_  
Lakshmi Amrutha Killada  
Integrated Design & Management Program  
May 06, 2022

Certified by: \_\_\_\_\_  
Dr.George Westerman  
Thesis Supervisor  
Senior Lecturer, MIT Sloan School of Management

Accepted by: \_\_\_\_\_  
Tony Hu  
Director  
Integrated Design & Management Program



# Understanding the Attitudes of Incumbent Manufacturing Workers toward Training Opportunities

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Lakshmi Amrutha Killada

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## Abstract

The number of manufacturing industry jobs has declined in the United States over the past decades. In 1979, there were 19.6 million of these jobs at the manufacturing industry's peak, but by 2019 that number had decreased to 12.8 million—a 35 percent decrease from its peak. Moreover, automation and other innovations in the industry have created a need for a new type of manufacturing worker with a different set of skills. Solutions such as recruiting younger workers, creating diverse pathways for manufacturing jobs, and providing training to incumbent workers have been proposed and implemented over the years; however, some workers are not taking advantage of these training opportunities.

To explore the question of *why these workers are not taking advantage of training opportunities?* We combined a literature review with quantitative research that included an analysis of a nationally representative survey of manufacturing workers—followed by recommendations to improve the intention to train among manufacturing workers. The intended goal of this investigation was not to determine whether a worker is motivated or not but rather to understand the factors that influence the motivations of workers to participate in training.

The findings of this study support the idea that just offering training to all employees is not equally effective, even though, across the board, workers are motivated to take training. Their decisions to do so are influenced by various sets of factors. The study identifies these factors and the nature of their influence on intention to train with recommendations for managers to manage them to increase worker interest in training.

This study provides a resource for organizations looking to transform their training programs or develop new initiatives by understanding key factors affecting workers' training decisions. It also provides critical recommendations for addressing these factors, bolstering the intention to train among the organization's workers.

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Thesis supervisor: Dr. George Westerman  
Title: Senior Lecturer, MIT Sloan School of Management



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# 1. Introduction

## 1.1 Motivation

The pandemic has erased approximately 1.4 million U.S. manufacturing jobs which has undone a decade of manufacturing job gains (Wellener, 2022). Between 2000-and 2010, the manufacturing sector lost close to 6 million jobs and closed 64,000 plants. (Charles et al. 2019). The massive U.S. trade deficit in goods rose in 2018 to \$891 billion, including more than \$120 billion in advanced technology goods (Swanson, 2019). These numbers are exacerbated even more by the lack of talent, decreasing interest in the industry from youth, retaining talent, and the introduction of automation is added to the effect of the pandemic. The manufacturing world has changed dramatically in the past decade because of globalization and innovation.

Manufacturing companies are addressing a shortage of skilled workers by recruiting more young people into the workforce (Gavin, 2021). However, this does not solve the problem since many young people consider manufacturing careers unattractive (*The Manufacturing Institute, 2020*). A more effective solution is to retrain workers who have jobs in manufacturing – incumbent employees - by providing extensive learning and development activities. This solution is attractive because incumbent employees have experience and knowledge of the industry and the foundational knowledge of technologies used in manufacturing. However, we found that only 63% of workers in the US said they participated in job-related training activities. Surprisingly, employers still reported talent shortages (Kasriel, 2017).

There are multiple programs and models available to educate workers in the manufacturing sector—Massachusetts alone has invested millions of dollars in workforce development programs to train the next generation of manufacturing workers (*EOHED Programs and Grants - Workforce Development*). That said, there is reason to doubt that many manufacturing workers have bought into the benefits of training. After all, this segment of the workforce has been hit hard by globalization and automation over the past century, particularly for workers who have low educational attainment.



According to a Georgetown University study, manufacturing jobs in the United States increasingly go to college graduates. In 2016, there were more than 3.6 million bachelor's degree holders employed in manufacturing up from 2.8 million in 1991, compared to 4.8 million jobs provided in 2016 alone for people without bachelor's degrees in the country (Carnevale et al., 2019). Many low-educated workers may see this as a sign that the manufacturing industry does not offer them opportunities for professional growth.

Leaders from across the business and government agencies need to start laying a common foundation for developing an adult education system. When seeking to promote the training of incumbent workers, it is essential to understand the factors that influence their decision to participate since it is not a simple decision of just availability and economics but many other influencing factors (Clochard et al.2020). To this end, we decided to survey incumbent workers to gauge the relative role of these factors in motivating the decision to participate in training.

Our study of manufacturing workers included a nationally representative sample of 612 manufacturing workers with different levels of education:

- High school educated: People who have graduated with high school diplomas or GED equivalent but did not pursue education beyond it.
- College-educated: People who have graduated from college with bachelor's or higher degrees.
- Middle educated: People who have some college education or associate degree but not a full bachelor's degree.

Many studies, particularly the human capital theory formulated by Becker (1962) and Rosen(1976), suggested that every individual worker has a set of skills or abilities which they can improve or accumulate through training and education. The increased diversity in the manufacturing workforce education levels will not allow us to look at the manufacturing workforce as one monolith; in addition, we see that three pathways to manufacturing emerged, and they lead to different jobs; for example, a typical high school diploma holder fills jobs such as assembly workers, machinists, and middle educated pathway includes workers with jobs such

as installation, maintenance, and college-educated fill jobs such as managers, industrial engineers (Carnevale et al., 2019). Hence, we will categorize workers in manufacturing into three categories: high school educated, middle educated, and college-educated.

Research in this thesis shows that workers from education groups are different in their access to taking advantage of training opportunities and have different effects from their training opportunities. Some workers who have taken the training opportunities struggle to transfer the skills and knowledge gained from training to their jobs. As 25.4% of high school-educated workers have answered the survey have reported that they are not able to transfer the skills and knowledge they gained from training to their jobs. Although workers across different educational backgrounds may take part in training, it is clear that those with further education benefit more from these training sessions. For example, 74.6% of college-educated workers are reported to be able to apply the skills learned through training courses to their jobs as opposed to high school or low educated workers, as we have seen above. Consequently, it is crucial that companies identify areas of disconnect and develop solutions to bridge the gap between training opportunities, the process of accessing these opportunities, and translating this knowledge into tangible results.

The study found that workers are very different in their demographics and influencing factors adding more disparity to their motivation to train in work-related activities. In addition to providing training opportunities to every level of worker, organizations also need to provide solutions tailored to each worker belonging to a different education group; for example, research from the survey data showed that high school-educated workers need opportunities, time, and funds but also there is a greater need for the organization to make these workers change their perception of training, providing them a more positive training experience. Providing more opportunities for training for all levels of workers could not possibly motivate workers across all education groups, who need more than just an opportunity, time, and funds, as there are many more influencing factors that we will discuss and analyze in this thesis.

## 2. Background literature

### 2.1. Overview

This study examined workers' motivations for participating in learning and development activities across educational levels (high school, middle, and college-educated). We sought to build a foundation for this understanding by researching the factors that influence these workers regularly.

Understanding the workers will help us provide the required resources for every worker from different education levels to take advantage of training opportunities. Formal education and skill level are often used synonymously (Clochard and Westerman, 2020). Education level is the most common measure of skill level. However, jobs have different skill requirements, and workers can expand skills not just through formal education but also by experience (Desjardins et al., 2006, Desjardins & Rubenson, 2011). Generally, skills learned on the job are not captured by a measure of formal education, which is problematic for blue-collar workers with low educational attainment. While education level does not always inform the skill level, it is a more measurable and less complex concept than skill level. Hence, for the purpose of this study, we will be using the education level of workers as a proxy for skill level.

To further the country's manufacturing technology and skill levels, the United States created 16 advanced manufacturing institutes. The institutes are working to develop technologies such as digital production, robotics, and additive manufacturing. However, the workforce education system is not yet equipped to provide the training needed for manufacturing industry workers (Westerman et al., 2021)

The Benchmarking Advanced Manufacturing Education: A study from the MassBridge Workforce Education Program (Westerman et al., 2021) study attributes the inability to provide training to workers as due, in part, to the complexity of the manufacturing education system, which includes many actors, each operating with its incentives, programs, and outcomes.

However, if all parties were to work together to scale up the training of incumbent workers through online content delivery, on-the-job training, as recommended in the study, could help serve the manufacturing sector's needs. Even if industry and education systems work in alignment, the benefit might not be felt the same across all levels of workers in manufacturing. Opportunities for training may be available, but the literature suggests that less-educated workers participate less in training and are less willing to train. (Leuven & Oosterbeek, 2000; Bassanini and Ok, 2004).

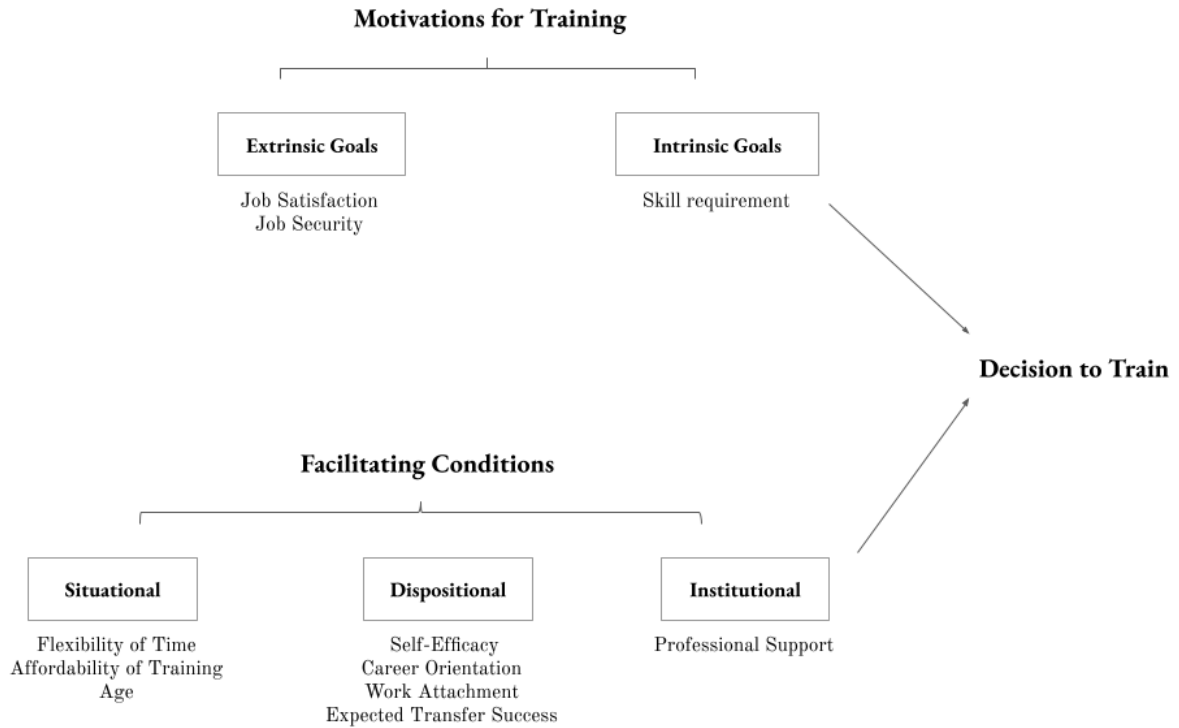
In Germany, researchers found a smaller return to training for low-educated workers; in France, the Netherlands, and the United Kingdom showed a more significant return to training for low-educated workers (Zwick & Kuckulenz, 2004; OECD 1999 as cited by Fourage et al., 2010). While economic gains might not directly indicate the motivation for training in low-educated workers, we also see in the literature that low-educated workers are less willing to participate in training (Borghans et al. 2008a as cited by Fourage et al., 2010). To illustrate, researchers found that low-educated employees tend not to believe that their skills can be transferred to their work (Iller 2005, cited by Cedefop, 2010). Sanders and de Grip (2004) discovered that training had little effect on the perceived employability of less-educated employees inside or outside the current workplace, impacting the decision to take advantage of training opportunities offered through training programs. Therefore, it is crucial to investigate why workers across all education levels may be motivated to undergo training.

## 2.2. Influencing factors

This paper extends the analysis in Clochard-Bossuet and Westerman 2020, which explicated the incentives of incumbent workers to undertake productivity-enhancing training. Elaborating on the contributions of these and other researchers, we provide a new model of this decision process. Like the previous paper (Clochard-Bossuet and Westerman, 2020), this thesis draws on Becker's human capital theory, which describes a worker's decision to learn as a decision made to maximize utility: how to get the most reward from an investment (1964). The worker weighs the benefits of training—higher-paying work or any number of rewards—against the potential

costs of taking training- time away from work, the expense of training programs, and many more constraints.

Figure 1: Model for the decision to train in manufacturing workers



Source: Adapted from Clochard, A., & Westerman, G. (2020, December 14). *Understanding the Incumbent Worker's Decision to Train: The Challenges Facing Less- Educated Workers*. MIT J-WEL.

The model in this paper devised for this thesis, like the Clochard and Westerman paper, uses two categories to explain why workers may take part in training: motivations for training and facilitating conditions. The first category—motivations—consists of two subgroups: extrinsic and intrinsic goals. Extrinsic motivation refers to external rewards that are received for taking part in training, such as a salary increase or promotion. Intrinsic motivation involves a desire to learn for the sake of learning, independent of external rewards. The second category—facilitating conditions—is broken down into three subgroups: situational, dispositional, and institutional factors. Situations are factors such as having the time or funds needed to take part in training; dispositions are characteristics such as being receptive to change or having high self-esteem; institutional factors include government policies and societal attitudes toward gainful

employment. For this thesis, we have extracted measurable influencing factors that contribute to the decision to learn in workers.

### 2.2.1 Job Satisfaction

Job satisfaction is the satisfaction of workers regarding pay, benefits, personal growth, and development at the current employer (Zhu, 2012). Training can lead to higher wages (Haelermans & Borghans, 2012); the Haelermans and Borghans analysis show that each training event is correlated with an average wage increase of 2.6%. Career changers may also benefit from training programs; 19% of US adults reported having undertaken training to change careers or jobs (NCES,2005). The National Household Education Survey reports that 22% of adults enrolled in non-degree learning programs reported doing so in order to get a raise or promotion. Furthermore, performance reward systems and formalized human resources policies have been linked with a higher incidence of training at work (O'Connell & Byrne, 2012). This is especially true in industries or sectors where skill requirements are not governed by license and certification requirements, and incentives are less clear, such as the manufacturing industry (Wotschack, 2019).

### 2.2.2 Job Security

Workers may enroll in training to keep their existing positions; nevertheless, research suggests that perceived job insecurity and job displacement significantly influence training participation (Elman & O'Rand, 2002). The more competitive a person thinks themselves to be, the weaker the link between job insecurity and training (Hootegem et al., 2018). Organizational and technological disruptions, according to research, can encourage training even if they threaten simply work changes rather than job losses (Tam, 2014).

### 2.2.3 Skill requirement

Workers who are motivated by a desire to feel competent at their jobs are more likely to participate in training and education; for example, wanting to “maintain or improve current

skills” is the most cited reason at 92% for participating in a work-related course in a survey of US adults (NCES, 2005). Job difficulty may influence this motivation, which may in turn influence training participation. However, lower-skilled white-collar workers are more likely than higher-skilled blue-collar workers to participate in education and training (Desjardins et al., 2006). This may be because some job requirements are better suited to development in a formal educational setting, while others are best learned on the job.

#### 2.2.4 Self-efficacy

Self-efficacy can be defined as one’s trust or faith in his or her ability to successfully tackle a task or situation for the purpose of this research activity pertaining to learning (Conner & Norman, 1996). This is exceptionally relevant for lower-skilled or lower-educated workers because classroom-based learning may be a less effective way of improving skills and education, as they might have negative associations with classroom-based situations.(Illeris, 2006) .For example, exam anxiety can negatively affect participation in further learning (Fourage et al., 2013).

#### 2.2.5 Career Orientation

The personality trait "self-directedness" or career orientation in this thesis-- the tendency to take ownership of one's professional trajectory by taking actions to achieve career goals --- has been linked to higher training incidence (Gijbels et al., 2012). Related attributes include the "extent to which employees create and update clear, specific, and plans for achieving career goals," a concept explored further in a study by Colquitt and Noe (2000). The degree to which an individual is working toward career goals has been suggested to indirectly promote the training intention of less-educated workers (Sanders et al., 2011).

#### 2.2.6 Work attachment

The extent to which workers identify with their job also affects how much they invest in training activities. Thus, people who identify strongly with their job are more likely to participate because

they have more to gain. (Rowold and Schilling, 2006; Maurer et al., 2003) .Work attachment includes a measure of belonging to the organization and effort at work for themselves and the organization. Training also encourages workers' organizational commitment, encouraging manufacturing workers to stay in their jobs with the company (Schneider and Flore, 2017).

### 2.2.7 Transfer Success

Employees who receive training will be able to use the knowledge they achieve at work or elsewhere. This can be influenced by how the employee's organization portrays training; for example, training can be encouraged by linking it to applications at work and can also improve self-efficacy, as prior participation in and prior transfer success of training are both associated with future participation (Guerrero and Sire 2001; Sousounis and Bladen-Hovell, 2010). Transfer success is a measure of the ability to transfer skills learned from training courses to their current jobs, changing the way of work to stay consistent with learnings, and validation from others on improvement in performance after training courses.

### 2.2.8 Professional Support

Support from supervisors is significant. The extent to which employees feel supported by their peers in the workplace impacts their motivation to learn (Sanders et al., 2011). Evidence shows that receiving advice or encouragement from someone at work can influence an employee's decision to partake in learning activities, whereas being seen learning by others can validate learning and make it seem more accessible. As Maurer et al. put it: "Perhaps it is not just the employee who initiates learning but the entire social system in which he or she is embedded" (Maurer et al., 2003). Professional support is a measure of support from supervisors, organizations, and exciting career opportunities at work.



### 2.2.9 The Flexibility Of Time And Affordability Of Training

Time flexibility can be critical for on-the-job training. Logistics pose a challenge to some people—for instance, 28% of 17% of U.S. adults said they were too busy at work or had childcare or family responsibilities as top reasons for not participating in formal or non-formal education (OECD, 2012). Higher education and vocational education literature demonstrate a negative relationship between cost and participation.

### 2.2.10. Age

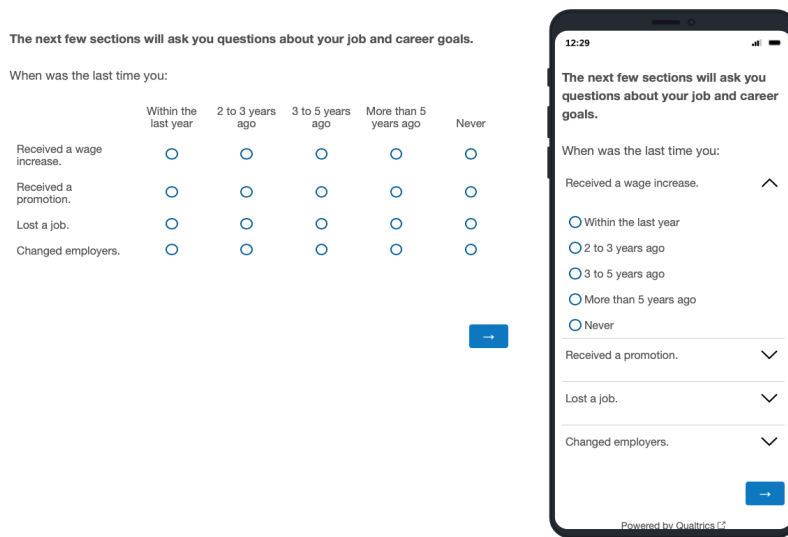
In 2021, 50.83% of the manufacturing workforce in the U.S. will be 45 or older (U.S. Bureau of Labor Statistics, 2022). For a long time, age has been connected to declining cognitive abilities. However, a study of manufacturing workers who were rehired after the 2014–2017 recession in the industry shows that they are able to retrain and reenter the workforce (Lewis-Charp, 2017); the Lewis-Charp paper also suggests that older workers preferred short-term, noncredit programs to longer-term credit programs according to the study. However, there is counter-evidence that motivation for training is negatively affected by age (Warr, 2001); another study also showed lower training participation of older employees concerning qualification levels, gender, or other training relevant characteristics (Tippelt et al.,2009). Therefore, it is essential to consider how age might influence training motivation.

### 3. Methodology and Data

#### 3.1. Methods overview

The underlying goal of this study is to examine what factors influence the intention to train among workers from different education levels. We sought to understand critical factors and their degree of influence on decision-making to pursue training or learning opportunities depending on an employee's level of formal education. In achieving a clear understanding of these factors, we hope to develop recommendations for manufacturing organizations on what they can do to encourage more employees to train and increase positive outcomes for their reskilling and upskilling efforts. Our research team took a three-step approach to conduct our research. First, we reviewed the existing literature on factors affecting how people decide to pursue training or educational opportunities at work. This helped us develop a foundational understanding of those factors. Second, we used that foundation to design and draft a survey questionnaire to gather data on the subject. Third, we analyzed our survey results with that foundational knowledge in mind to rigorously explore our data in-depth and test our hypothesis and finally, recommendations, and this part is exclusively and independently performed by the author of the thesis.

Figure 2: Screenshot of the survey on Qualtrics platform



Source: Screenshot of the survey in both desktop and the mobile view from qualtrics

The survey explores reasons for training, attitudes towards training, factors independently of training, and then factors combined with training. Existing scales for measuring the factors in the model are used to construct the survey. The survey has 62 questions/statements with a median completion time of 8.6 minutes, as determined from the pretest. To gather a nationally representative sample of manufacturing workers, we contracted with IPSOS. The survey is distributed using email; participants are directed to the survey via a link that requires no login name or password. After three days, IPSOS contacted nonresponding participants with automatic emails and used customer reminder schedules to follow up. The survey was pretest over three days with a sample size of 93 persons, with participation from 47 respondents and a completion rate of 51%. In response to the pretest survey, we updated many screening questions in the main survey. In the main survey, IPSOS contacted 1556 individuals over seven days 875 participants completed the survey for a completion rate of 56%. To match the geodemographic benchmarks secured from the U.S. Census Bureau's American Community Survey and the 2020 March supplement of the U.S. Census Bureau's Current Population Survey, IPSOS used a probability-proportional-to-size procedure to select study-specific samples using gender, age, race, education, census region, household income, homeownership status, household size and metropolitan area as weighting variables.

### 3.2 Data

For the desired data, as we have mentioned in the above section, we have utilized the survey as a tool to reach our desired sample of manufacturing workers in the United States. The survey focused on employed manufacturing workers over the age of 18 in industries across the workforce—scoping down for manufacturing workers and made it available in English and Spanish to ensure further representativeness.

Table 1: List of manufacturing industries that workers are surveyed.

Industry codes	Manufacturing industry
311000	Food Manufacturing
321000	Wood Product Manufacturing
323000	Printing and Related Support Activities Manufacturing
325400	Pharmaceutical and Medicine Manufacturing
326000	Plastics and Rubber Products Manufacturing
332000	Fabricated Metal Product Manufacturing
333000	Machinery Manufacturing
334000	Computer and Electronic Product Manufacturing
335000	Electrical Equipment, Appliance, and Component Manufacturing
336000	Transportation Equipment Manufacturing
339000	Other Manufacturing

*Note: The table shows the industry codes of manufacturing industries from which workers are surveyed for this thesis.*

The nationally representative sample increases the likelihood that our findings accurately describe the actual population of U.S. manufacturing workers, rather than just a characteristic of a possibly-biased sample of survey respondents. Therefore, except where noted, we used population weights provided by IPSOS to more accurately represent the population, diminish the effect of inherent biases of the survey mode being used, and ensure that hard-to-reach demographic groups are represented in the survey. In the final sample, there were 612 respondents in four stratified levels of education: high school diploma or GED; high school diploma or equivalent to GED; some college or Associate’s degree; and bachelor's degree or higher. We focused on three levels of workers belonging to the survey's highest education levels: high school, middle educated, and college-educated.

- Less than high school: individuals without a high school diploma or GED
- High school: individuals with a high school diploma or GED
- Middle-educated: individuals with some schooling beyond high school but not a four-year degree
- College: individuals with a four-year baccalaureate or higher degree.

The 'No high school diploma or GED' which is less than high school, is not included in the analysis or combined with the high school-educated group because the sample size was small (N=40), and people in this group can be expected to experience different work attitudes and incentives to learn than those with more education. However, bachelor's and higher degree holders are grouped into one since we expect them to have similar work experiences and attitudes towards motivation for training.

In the next section of analysis and results, we first conduct factor analysis, where we will review the questions asked in the survey and the factors we have defined in the background literature as part of our model to test for predictors for intention to train. We will conduct this factor analysis to validate our background literature guided categorization of questions into factors. Once we have our factors, we will perform an ANOVA test to compare the workers from different education tiers and identify where they are different and how different they are among the factors; as part of the ANOVA results, we will also be able to observe similarities too. Further, we will perform a regression analysis to identify the predictors for the intention to train.

## 4. Analysis and Results

From the literature review, we identified key factors affecting the intention to train among employees from different education categories. We categorized the questions in the survey using the understanding of the factors from background literature. Further, we conducted a factor analysis to validate our categorization, and based on the iterative validation process, we determined the factors by averaging the identified questions under each factor. The new set of questions can be seen below; however, a complete list can be viewed in the appendix.

Table 2: Questions from the survey categorized by factors after the validation analysis

Factor	Questions
Job satisfaction	<p><i>How satisfied are you with this aspect of your job:</i></p> <p>The amount of pay and fringe benefits I receive</p> <p>The amount of personal growth and development I get in doing my job</p> <p>The amount of challenge in my job</p>
Job security	<p><i>Please indicate the extent to which you agree or disagree with each of the following statements:</i></p> <p>I have a high level of expertise and skill in my occupation.</p> <p>I feel confident in my ability to do my job.</p> <p>I am satisfied with my performance on the job.</p>
Skill requirement	<p><i>Please indicate the extent to which you agree or disagree with each of the following statements:</i></p> <p>My job requires that I learn new things.</p> <p>My job requires a high level of skill.</p>
Self efficacy	<p><i>Please indicate the extent to which you agree or disagree with each of the following statements:</i></p> <p>When facing difficult tasks, I am certain that I will accomplish them.</p> <p>I believe I can succeed at most any endeavor to which I set my mind.</p> <p>Compared to other people, I can do most tasks very well.</p>

Career oriented	<p><i>Please indicate the extent to which you agree or disagree with each of the following statements:</i></p> <p>I have clear career goals.</p> <p>I know what I need to do to reach my career goals.</p>
Work attachment	<p><i>Please indicate the extent to which you agree or disagree with each of the following statements:</i></p> <p>I feel myself to be part of my company</p> <p>In my work, I like to feel that I am making some effort not just for myself, but for my organization as well.</p> <p>The offer of a bit more money with another employer would not seriously make me think of changing my job.</p>
Transfer success	<p><i>Please indicate the extent to which you agree or disagree with each of the following statements:</i></p> <p>I am able to transfer the skills learned in training courses back to my job.</p> <p>I have changed the way I work in order to be consistent with the material taught in training courses.</p> <p>Other people have told me that my performance has improved following a training course.</p>
Professional support for career development	<p><i>Please indicate the extent to which you agree or disagree with each of the following statements:</i></p> <p>My organization actively supports my career development.</p> <p>My supervisor brings up opportunities for development in our conversations.</p> <p>I have interesting career advancement opportunities at my current employer.</p>
Time and Cost	<p><i>Please indicate whether each statement applied to you.</i></p> <p>I am able to take time off during work hours to pursue learning activities.</p> <p>In general, my employer pays for training.</p>

*Note: The tables show the questions categorized into different potentially influencing factors for intention to train among workers from different education tiers. This categorization created the factors by averaging the survey questions.*

The same iterative process is applied to arrive at the dependent variable that will be used in the tests for most of the analysis. The initial list of dependent variables across the education tiers can

be seen below. The data suggests that the more educated a worker is, the more likely the employer is to require the worker to complete mandatory training. When asked if workers were offered optional training opportunities by their employer, we see that the trend continues where a higher number of workers offered training opportunities increases with educational attainment. Moreover, we see that the numbers decrease when asked if they participated in them; hence we see that the sample size for the first two questions is different from the last one in the table below, as only a few workers from each education tier took these optional opportunities. However, the trend stays consistent where there is an increase in participation with educational attainment.

Table 3.a: Variation of dependent variable 1 across education tier

I have been required by my employer to complete mandatory training in the past year.					
With population weights	No high school diploma or GED (N=40)	High school educated (N=210)	Middle educated (N=184)	College educated (N=178)	Full sample (N=612)
Yes	35.00%	42.90%	56.20%	69.70%	54.20%
My employer has offered optional training opportunities to me in the past three years.					
Yes	30.00%	38.80%	48.40%	58.10%	46.70%
Did you participate in at least one of these optional training opportunities?					
With population weights	No high school diploma or GED (N=5)	High school educated (N=54)	Middle educated (N=97)	College educated (N=107)	Full sample (N=263)
	%	%	%	%	%
Yes	91.70	50.60	83.30	80.80	73.50

*Note: Answers here are measured on a binary scale of 'Yes' and 'No'. The table shows percentages of workers from different education tiers that have answered 'Yes'. We used population weights to represent the national representation of the sample. For example, 42.90% of high school educated workers have answered 'Yes' to the question 'I have been required by my employer to complete mandatory training in the past year.'*



Table 3.b: Mean and Standard Deviation of dependent variables 2 and 3

With population weights (N=612)	Mean	Std. Deviation
I am interested in participating in learning, training, and development activities.	5.26	1.37
I feel favorably toward the idea of improving my career skills.	5.37	1.26

*Note: Answers for this questions are measured on a seven point Likert scale (1 “Strongly disagree”; 2 “Disagree”; 3 “Somewhat disagree”; 4 “Neither agree nor disagree”; 5 “Somewhat agree”; 6 “Agree”; 7 “Strongly agree”). Hence the mean will be between 1 to 7 for these questions. We used population weights to represent the national representation of the sample.*

Further we found that the last two dependent variables have a correlation of 0.739\*\*, and because of this high degree of correlation, we averaged the questions to create a new variable which we called intention to train which has a mean of 5.42 and standard deviation of 1.17.

Table 4: Correlations between summarized influencing factors and intention to train

Pearson correlation	Intention to train	Job Satisfaction	Job Security	Skill Requirement	Self Efficacy	Career Oriented	Work Attachment	Transfer Success	Professional Support	Time and Cost
Intention to train										
Job Satisfaction	.296**									
Job Security	.249**	.260**								
Skill Requirement	.313**	.370**	.310**							
Self Efficacy	.429**	.347**	.545**	.209**						
Career Oriented	.322**	.527**	.350**	.252**	.458**					
Work attachment	.257**	.533**	.372**	.343**	.293**	.385**				
Transfer Success	.574**	.378**	.271**	.260**	.385**	.653**	.297**			
Professional Support	.395**	.504**	.233**	.301**	.258**	.444**	.517**	.719**		
Time and Cost	.194**	.349**	0.707	.286**	0.058	.111*	.242**	.345**	.457**	

*Note: The table shows the correlation coefficients associated with factors that may influence workers' intentions to train. This table reports the pearson correlation coefficients between the key variables, using the nationally*

representative survey sample which consists of 612 observations. \*\* denotes statistical significance at the level of  $p$ -value  $<.001$ .

For further analysis in chapter 4, we have conducted an exploration of demographic data across different education levels from the survey, where we have analyzed data regarding age, household income levels, marital status, race/ethnicity, gender, presence of children, living in a metropolitan area or not. The demographic analysis provides us with nuanced knowledge of the backgrounds of workers from different education levels that are not included in the motivations for training and facilitating conditions in the model.

#### 4.1. Demographics of the sample

##### 4.1.1. Age

Across the education tiers, we see that more of the workers belong to the age range of 51 to 83 years; we also see that the highest number of younger workers are college-educated. We also see that many of the younger workers between the ages of 18 to 35 years belong to ‘No high school diploma or GED’, which might be because they are young and still pursuing education.

Table 5: Age variations across education tier

Age	No high school diploma or GED (N=40)	High school educated (N=210)	Middle educated (N=184)	College educated (N=179)	Full sample (N=612)
With population weights	%	%	%	%	%
18 to 35 years	42.5	18.2	27.2	30.2	26.0
36 to 50 years	37.5	31.1	29.9	32.4	31.5
51 to 83 years	20.0	50.7	42.9	37.4	42.5

*Note: The table shows the percentages of age range of workers from different education levels from our nationally representative survey sample. We used a text box to gather survey respondents' exact age, then converted those answers into ranges: 18-35 years, 36-50 years, 51-83 years. We used population weights to represent the national representation of the sample.*

### 4.1.2. Household Income levels

Across education tiers, we see that with higher educational attainment, the income levels rise, as evidenced by the percentage of the population in each education level belonging to high income between \$100,000 to \$150,000 or more, increases from 27.60% in the high school-educated group to 43.50% in the middle educated group to 72.60% belonging to the college-educated group.

Table 6: Household income levels across education tier

Household Income		No high school diploma or GED (N=40)	High school educated (N=210)	Middle educated (N=184)	College educated (N=179)	Full sample (N=612)
With population weights	Range	%	%	%	%	%
Low income	less than \$10,000 to \$49,999	27.5	28.1	17.4	6.7	18.6
Middle income	\$50,000 to \$99,999	55.0	44.3	39.1	20.7	36.5
High income	\$100,000 to \$150,000 or more	17.5	27.6	43.5	72.6	44.9

*Note: The table shows the percentages of household income levels of workers from different education levels from our nationally representative survey sample. We measured this item with a seven point scale of income levels (1 “Less than \$10,000”; 2 “\$10,000 to \$24,999”; 3 “\$25,000 to \$49,999”; 4 “\$50,000 to \$74,999”; 5 “\$75,000 to \$99,999”; 6 “\$100,000 to \$149,999”; 7 “\$150,000 or more”). We converted the individual responses into ranges for ease of performing statistical analysis. We used population weights to represent the national representation of the sample.*

### 4.1.3. Race/Ethnicity

Across education tiers, we see that many manufacturing workers identify as ‘White,’ the population identifying as ‘Black’ reduces in percent as the educational attainment increases with

the exception of ‘No high school diploma or GED.’ In contrast, a considerable portion of ‘No high school diploma or GED’ manufacturing workers identifies as Hispanic.

Table 7: Race/Ethnicity variation by education tier

Race	No high school diploma or GED (N=40)	High school educated (N=210)	Middle educated (N=184)	College educated (N=179)	Full sample (N=612)	U.S. population average from 2021 US Census
With population weights	%	%	%	%	%	%
White,Non-Hispanic	37.5	64.8	70.1	68.5	65.7	60.1
Black,Non-Hispanic	7.5	11.0	12.0	9.0	10.5	13.4
Other,Non-Hispanic	0.0	0.0	3.8	9.0	3.8	5.2
Hispanic	55.0	19.0	13.0	5.1	15.5	18.5
2+ Races,Non-Hispanic	0.0	5.2	1.1	8.4	4.6	2.8

*Note: The table shows the percentages of race/ethnicity of workers from different education levels from our nationally representative survey sample. We used population weights to represent the national representation of the sample. For example, 64.8% of high school educated workers reported they are White, Non-Hispanic.*

#### 4.1.4. Other demographic categories

Across education levels, we see that the majority of manufacturing workers from our survey sample are married, identify as male, have no children, and live in metropolitan areas. It is interesting to note that manufacturing workers from our sample identify as male more than the national average in all industries. We see that, on average, manufacturing workers have higher rates of marriage than the U.S. population also, and the percentage of manufacturing workers who have no children differs by 9.6% more than the national average. Finally, the percentage of manufacturing workers living in metropolitan areas corresponds well with the national average.

Table 8: Demographics of marital status, gender, presence of children in the household, and living in metropolitan areas.

	No high school diploma or GED (N=40)	High school educated (N=210)	Middle educated (N=184)	College educated (N=179)	Full sample (N=612)	U.S. population average from 2019 US Census
With population weights	%	%	%	%	%	%
Now Married	15.0	58.4	59.8	72.6	60.1	53
Male	61.5	70.8	71.7	67.6	69.6	49.48
No Children	67.5	69.5	72.8	65.4	69.6	60
Metro	90.0	70.3	79.9	91.0	80.5	80.7

*Note: The table shows the percentages of demographics such as marital status, gender, presence of children in the household, and status of living in metropolitan areas of workers from different education levels from our nationally representative survey sample in comparison to the U.S. population average from the 2019 census report. For marital status, we have measured the status on a 5 point scale of (1 “ Now married”; 2 “Widowed”; 3 “Divorced”; 4 “Separated”; 5 “Never married”), for the ease of performing statistical analysis we have converted the responses from 2,3,4, and 5 as ‘Not Married Now’.*

The demographic analysis helped compare the workers across education tiers to the overall national average across U.S. demographics. We included age, marital status, income levels, having children, gender, living in a metro and non-metro, and race as control factors in the regression to account for the variations we have seen in the demographic analysis. For the purpose of the regression, we have recorded the control factors to be dichotomous variables, such as Gender is recorded as Male/Female, and so on for other control factors. For non-dichotomous variables such as race/ethnicity, income levels, and age, we have created dummy variables where for all but one of the levels of the categorical variable, a new variable was created that has the value of one for each observation at that level and zero for all others.

## 4.2. Exploring differences and similarities between the possible factors

As we see from the demographic analysis that workers are very different in their backgrounds, we might expect these differences in factors contributing to their intention to train from ANOVA results. We might expect to see significant differences in their ages. The demographic analysis shows that college-educated workers are mostly younger, and high school educated workers are 51 to 83 years old. We can also expect that there will be significant differences in their skill requirements since with higher educational attainment, the difficulty of job tasks and the need for requiring new skills in the jobs might increase. We also expect significant differences in the group's self-efficacy as an opportunity to work on complex tasks and require high skill might increase with educational attainment, and lower-educated workers might not have gotten such opportunities often compared to other groups. We also expect to see significant differences in the groups' flexibility to take training. Some workers might not be able to take time off from work to pursue training or have the funds to afford training if the employer does not pay for training activities. In the rest of our analysis, we will not consider workers in the "No high school diploma or GED" category since they make up a small fraction of the overall sample, N=40.

Table 9: Mean and Standard deviation of key constructs across education tiers. The highlighted factors are the significant differences between the groups.

Factor	High school educated (N=210)	Middle educated (N=184)	College educated (N=179)
With population weights	Mean(Std Dev)	Mean(Std Dev)	Mean(Std Dev)
Intention to train	5.18(01.10)	5.35(01.23)	5.75(00.99)
Job satisfaction	5.05(01.25)	5.03(01.28)	5.00(01.48)
Job security	6.03(00.92)	6.03(00.74)	6.02(00.74)
Skill requirement	4.78(01.33)	5.21(01.41)	5.69(01.08)
Self efficacy	5.88(00.96)	6.11(00.79)	6.18(00.74)
Career oriented	5.07(01.30)	5.00(01.30)	5.13(01.47)
Work attachment	4.9(01.31)	5.10(01.20)	5.18(01.14)
Transfer success	4.59(01.47)	4.70(01.12)	4.74(01.19)
Professional support	4.00(01.75)	4.04(01.54)	4.34(01.65)
Time and cost	0.47(00.38)	0.57(00.35)	0.70(00.35)
Age	48.29(12.53)	45.65(12.47)	44.73(12.47)

*Note: The table shows which factors are significantly different among workers from different education tiers. The table reports each factor's mean and standard deviation for different education levels. The highlighted data indicates that the factor is significantly different among workers from different education groups. This analysis is conducted on a nationally representative sample of manufacturing workers. We used population weights to represent the national representation of the sample.*

We see that the dependent variable of intention to train is significantly different among education groups with ANOVA results. Other factors where workers from different education groups are significantly different are skill requirements, time, and cost. High school educated and college-educated groups are different in terms of the age factor. We see that high school educated workers have reported less intention to train when compared to other education groups- High school educated < Middle educated < College-educated due to potentially many influencing factors, which we will identify in the next part of the analysis through regression. We also see that the manufacturing workers across the education tiers from our survey sample show that the skill requirement also increases as the educational attainment increases with High school

educated < Middle educated < College-educated this can be since the presumption that difficulty of job tasks and the need for new skills increase with income levels, and we found that high school-educated workers have lower income levels than their counterparts they might require fewer skills in their jobs relative to other workers in different education groups. We also see from ANOVA that there are significant differences in flexibility between the groups regarding time and cost of training, High school educated < Middle educated < College educated. While we also see significant age differences, only between high school educated and college-educated, with college-educated are younger than other groups.

Although some of the factors are not significantly different, they add value in adding context to the bigger picture. We see that all education tiers have similar job satisfaction—they are satisfied with their pay and benefits—and we also see that they have similar self-efficacy and belief in their abilities to accomplish complex tasks. Furthermore, the similarities in career orientation, professional support, and transfer success show that high school-educated and college-educated groups are motivated to improve their careers, receive professional support, and believe in their ability to transfer knowledge from training courses to their jobs. Therefore, we must conduct further research on these factors to understand what predicts the intention to train. Workers across the education tiers are equally motivated, believe in their ability to take on difficult tasks, and receive professional support from their employers.

#### 4.3 Understanding the influences on intention to engage in training

ANOVA results show that workers in the High school educated, Middle educated, and College educated groups to have more similarities than differences; however, from the demographic analysis, we see that there are many differences in the workers. Hence we expect to identify several potentially influencing factors in training among different education tiers workers. While there may be common influences across the populations, each category might still have different influencing factors. Therefore, we examined the influences on the whole population and how the influences vary across education tiers.



### 4.3.1 Influences by education tier

#### **Influences for the full sample of manufacturing workers' intention to train**

As guided by the background literature for the total sample of manufacturing workers, we can expect to see job satisfaction as an influencing factor since training can lead to higher wages. We see that better pay, benefits, personal growth and development can contribute to a worker's job satisfaction increasing the intention to train. We can also expect to see career orientation as an influencing factor among the general population, as background literature showed that 19% of US adults had reported a change of careers or jobs as a reason to take training (NCES, 2005). We can also expect to see skill requirement as an influencing factor since maintaining or improving current skills is the most cited reason for participating in training, as reported by 92% of workers who have participated in work-related courses in a survey of US adults as reported by NCES in 2005. We can also expect to see transfer success as an influencing factor for the general population's intention to train. We see that prior transfer success of training knowledge to jobs is associated with future participation as per the background literature we have found (Guerrero and Sire 2001; Sousounis and Bladen-Hovell, 2010).

From the regression analysis reported in the table below (Table 10), the influencing factors for the general population are job satisfaction, skill requirement, self-efficacy, transfer success, professional support, and time and cost. The relationship between professional support and intention to train is negative, indicating that increased professional support makes workers less likely to pursue training opportunities. However, when we look at the correlation between professional support and intention from the previous section, we see that professional support is positively correlated with the intention to train. While the presence of professional support is a great thing in itself, it might also be seen as pressure when other factors are present.

For the regression analysis we reported beta, the beta coefficient is the degree of change in the dependent variable for every 1 unit change in the independent variable (factors). It can be both positive or negative.

Table 10: Influences for intention to train among all groups

With population weights	General population	High school educated	Middled educated	College educated
Job satisfaction	0.412***	0.21	0.039	0.180
Job security	-0.040	-0.13	-1.568	0.048
Skill requirement	0.130**	-0.152**	0.189***	0.291**
Self efficacy	0.682***	0.608***	2.312**	0.026**
Career oriented	0.090	0.02	0.089**	0.23
Work attachment	0.070	0.012**	0.313	0.058
Transfer success	0.643**	0.471**	0.217**	1.046***
Professional support	-1.044***	-0.972***	-0.142**	0.022
Time and cost	0.527***	0.712***	-0.210	0.370***
Controls				
Age range 18 to 35	0.221***	0.103	0.515***	-0.233**
Age range 36 to 50	0.046	-0.116	-0.128	0.044
White	0.043	-0.091	-0.159	-0.382**
Black	-0.029	-0.026	0.116	0.008
Hispanic	0.160**	0.111	0.511***	-0.047
Two or more races	0.160**	0.006	0.067	0.085
Male	-0.048	0.122	0.101	-0.157
Low income	0.003	-0.049	-0.806**	0.137
High income	0.166**	0.168**	-0.074	0.035
Not married	0.102	0.490***	-0.290	-0.072
Metro	-0.018	-0.264**	0.103	-0.032
Have children	0.100	0.039	-0.140	-0.171

*Note: Across all the education tiers we have used intention to train as a dependent variable. The factors of job satisfaction, job security, skill requirement, self efficacy, career orientated, work attachment, transfer success, professional support are standardized to have a minimum of 1 and maximum of 7. For the time and cost the responses are standardized to have minimum of 0 and maximum of 1. The table shows the Beta values from the regression analysis for exploring the factors that predict the intention to train among workers from different workers with the control factors listed above including the control factors listed in the table. The factors that have results with the '-' symbol indicate that those factors have a negative effect on the intention to train. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$ .*

## **Influences for high school educated workers' intention to train**

Due to many experiential differences among different manufacturing workers, we expect to see many combinations of factors influencing a person's motivation to take training. We see this from ANOVA, where high school educated workers reported requiring relatively fewer skills in their jobs than middle educated and college-educated workers; hence, we can expect this as an influencing factor for high school-educated workers. Also, from the ANOVA analysis, we might expect to see time and cost as influencing factors in their intention to train since high school educated workers reported less flexibility in taking time off from work to pursue training than middle educated and college-educated workers.

As we see that high school-educated workers reported fewer skill requirements in their jobs compared to other education groups of workers and employers might be less likely to pay for their training, therefore workers cannot take time off from work to pursue training without being penalized for it by a cut in wages and invest in their career development. This lack of investment in high school educated workers' training might contribute to the perception of a lack of professional support among these workers. Hence, we can expect to see career orientation and professional support as influencing factors for high school-educated workers.

However, we see from the regression results that for high school-educated workers, the influencing factors are skill requirement, self-efficacy, work attachment, transfer success, time and cost, and professional support. Professional support and skill requirements negatively influence the high school-educated worker's training decision. A possible explanation for the negative relationship between skill requirement and intention to train is perhaps because if a worker's job is repetitive and even after training the job task does not change then there is less incentive to train. The negative relationship between professional support for career development and intention to train may be a result of the current structure of the professional support provided.

### **Influences for middle-educated workers intention to train**

As we have seen from demographic and ANOVA analysis that high school educated and middle educated workers are different, we can expect to see different factors influencing their intention to train. From ANOVA, we see that middle-educated workers reported having more skill requirements in their jobs than high school-educated workers. Since middle-educated workers have jobs that require him or her to learn new things and higher expertise, we expect job satisfaction and skill requirement can be influencing factors for intention to train. Furthermore, we might also see professional support as a predictor of intention to train since he or she might receive more support from organizations than a high school educated worker because his/her work requires high skills, and organizations might provide support to train and let him/her take time off from work and also pay for his/her training. Hence we expect to see professional support, time, and cost to be influencing factors.

However, the regression analysis shows that the factors influencing middle-educated workers' decisions to take up training include skill requirement, self-efficacy, career-oriented, transfer success, and professional support. As we have seen from high school educated workers, professional support is also a negative influencing factor. A new factor that is absent in motivating intention to train in high school educated workers but present in middle educated workers is career-oriented, showing that middle educated workers who have clear career goals and know what to do to achieve them will motivate their intention to train. Additionally, we see that workers from the age range of 18 to 35 have a positive influence on motivation to take up training.

### **Influences for college-educated workers' intention to train**

As we see from ANOVA that college-educated workers report higher skill requirements in their jobs than other groups with lower educational attainment, we can expect to see skill requirement as a predictor of intention to train among the college-educated workers in manufacturing. The need for higher skill requirements in their jobs might influence college-educated workers to take training to keep up with their job demands and be rewarded by their employers. Rewards for

keeping up with job demands by constantly learning can contribute to transferring knowledge from training to their jobs; hence we can also expect to see transfer success as a predictor of college-educated workers' intention to train. We also see that they reported having more flexibility in taking time off from work to pursue training, and employers are more likely to pay for their training when compared to other groups; hence, we can also expect to see time and cost as influencing factors for college-educated workers' intention to train.

However, the regression analysis shows that college-educated workers are influenced by skill requirements, self-efficacy, time and cost, and their ability to transfer knowledge learned in training to the workplace. All the factors have a positive influence on motivations to train.

Across the levels of education, we see a varied set of factors influencing people's decisions to pursue the training. Among these factors are skill requirements, self-efficacy, and transfer success. However, we see that factors such as work attachment are unique to the high school-educated workforce, while factors such as career-oriented are unique to the middle-educated workforce.

In the next section, we will be using the above analysis and results to discuss our findings and provide recommendations to improve the intention to train among the general population and across different education tiers.

## 5. Discussion and Recommendations

High school-educated workers make less money than their higher-educated peers, yet they also express less intention to train. When allowed to take a training course, only 50.60% took it, compared with 83.30% middle-educated and 80.80% college-educated, as seen in Table 3.a. Why would a worker choose not to do so if given the option to train and potentially improve their income?

Our findings show that the answers are much more complex than this question suggests. The decision to engage in training is influenced by several factors beyond just the need for skills or desire for income. Furthermore, people with different levels of education experience these influences differently. Therefore, employers and policymakers hoping to help people grow in their careers must look deeper to develop effective programs for all categories of workers. As we have seen from the analysis in the above sections, the categories of workers are different when it comes to factors that influence their intention to train. This helped us in developing the personas of the workers from the data. Which provides a structure for discussing workers' motivations for training; we will be talking through in-depth insights that we gained from our analysis.

In this chapter, guided by the analysis we have conducted in the previous sections, we will be recommending improving different education groups' intention to train.

### 5.1. Recommendations

Recommendations for the general population of workers from the sample

We see from the analysis in the previous section that the intention to train among the full sample of manufacturing workers from our survey is influenced positively by job satisfaction, self-efficacy, skill requirement, transfer success, time and cost, and negatively influenced in their intention to train by professional support. We will utilize this analysis to formulate recommendations for improving their intention to train among the general population of workers from our survey sample.

- ***Increasing employees' satisfaction with their jobs can also be beneficial to the intention to train manufacturing workers.*** Job satisfaction is a measure of satisfaction with the pay, benefits, personal growth, development, and challenge in the jobs. Motivating employees to participate in training programs by promising they will reap the rewards in the form of better pay and benefits and improved performance on the job will stimulate them to take an interest in their work. Organizations can provide challenging tasks after training courses to make employees more interested in participating in work-related training.
- ***Training, in combination with difficult tasks, can produce a sense of confidence in workers.*** This leads them to attempt more difficult tasks and experience a greater sense of self-efficacy, thereby increasing their intention to train.
- ***Provide opportunities for employees to practice a high level of skill at their jobs.*** As workers take on more challenging tasks at their jobs, the need to learn new things will increase because workers will need to develop higher skill levels than before. This will then lead to increased intention to train.
- ***Ensure that training opportunities show clear ways to transfer knowledge to work.*** When workers get opportunities to transfer the skills, they learn in training to their jobs, and they become more engaged. Provide employees with assessments that show them how much they have learned and allow them to see the impact of their training on their job performance to increase their intention to train.
- ***Provide workers with training that is convenient and affordable.*** Workers do not always have time or the funds to pursue training activities. However, we can provide them with some of the training online through digital learning platforms, making it possible for them to pursue training on-demand at their own pace and time. This online training delivery can be less expensive than the traditional in-person training, where costs can arise from hiring a trainer, commuting to the training site, and other costs associated; for

example, perhaps the worker is a single mother, and she has to hire a babysitter for her kid to take the in-person training.

- ***Improve the professional support provided to the workers.*** We have found that a presence of professional support, i.e. support from supervisors and the organization and the availability of interesting job opportunities, decreases employees' intention to train and an improvement to the current professional support structure might change the attitude. For example, Providing workers with clear, concrete pathways of career development might improve their motivation to train.

#### Recommendations for high school educated workers

We see that there are common factors that affect the intention to train among workers in the general population and high school educated groups. They are both positively influenced by self-efficacy, transfer success, time, and cost and negatively influenced by professional support. However, skill requirements and work attachment are unique factors that influence high school-educated groups that are not present in the general population. Skill requirements affect the intention to train negatively among high school-educated workers. Hence, many of the recommendations that address the general population apply here. Hence, we provide recommendations to factors that are unique to high school educated workers' intention to work.

- ***Show workers' impact on the organization to increase high school educated workers' intention to train.*** We see that workers are influenced by positive work attachment. In positive work attachment, a worker feels part of the organization, and they make an effort not just for themselves but also for the organization. This sense of belonging will increase their perceived value in the organization and in turn, increase their intention to train.
- ***Provide high school educated workers with higher-skilled jobs concurrently with training activities.*** Because the high skill level required in jobs adversely affects workers' intention to be trained, employers should develop training programs for their workers to enable them to build high-level skills. For example, training should include practice for



new skills and opportunities for workers to get feedback on their performance as they go along.

#### Recommendations for middle educated workers

We see from the analysis in the previous section that the intention to train among the middle-educated workers from our survey is influenced positively by self-efficacy, skill requirement, transfer success, career-oriented, and negatively influenced in their intention to train by professional support. As opposed to high school educated workers' relationship with skill requirement, which is negative, in middle educated workers their relationship with skill requirement is positive. We have already addressed recommendations for factors of self-efficacy, transfer success, and professional support in the general population.

- ***Provide guidance in navigating career paths at the organization to increase intention to train middle educated workers.*** We see that workers who have clear career goals and know what to do to achieve them are motivated to train. Providing workshops where workers can develop career goals can increase the intention to train among middle-educated workers.
- ***Providing challenging job tasks or jobs that require a high level of skill to middle educated workers to increase the intention to train.*** We see that workers who have jobs that require them to learn new things and a high level of skill are more likely to participate in training.

#### Recommendations for college-educated workers

We see from the analysis in the previous section that the intention to train the college educated workers from our survey is influenced positively by self-efficacy, skill requirement, and transfer success. We have already provided recommendations for improving these factors in the general population.

## 6. Conclusion

Automation and advanced manufacturing technologies have created a skills gap in the manufacturing industry, which is unlikely to be resolved by training new workers alone. Therefore, manufacturers see it is critical to train incumbent workers. When organizations offer training programs, not all participating workers benefit from them, which might affect future training participation. This study identifies how to improve workers' intentions to train in manufacturing organizations across three different education tiers: high school, middle, and college-educated.

In analyzing a nationally representative manufacturing workers survey, we found that the workers from different education tiers have different factors influencing their intention to train. After extensive statistical analysis, we provided recommendations for each group of workers from different education levels. We hope that what we found is helpful for organizations and policymakers to create training programs that will meet the diverse needs of workers from different education tiers.

We recognize that there are limitations to our study. We could not know why a worker answered yes, no, or strongly agreed to a particular question. For example, the worker might answer that he or she strongly agrees that they are satisfied with the professional support they receive from their organization, but without further study of practice at the organization, we have no knowledge of why this answer was given. We analyzed workers' perception of abstract training opportunities, but we did not examine in depth the specific training opportunities that workers received, which could be further research. For further research, we also suggest that an investigation into organizations that are found to train their employees successfully will help identify best practices that the industry could adopt. We think it would be worth examining whether the principles outlined here would be relevant for industries where training is pertinent to a workers experience at an organization. For example, many professionals in the healthcare industry need to continue their learning well after their college education.

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## 8. Appendix

### Survey Questionnaire

- Do any of the following currently describe you?

*Select one answer from each row.*

*Employment status in rows:*

1. Employed full time (35 hours or more per week) for pay with an organization or company
2. Employed part time (less than 35 hours per week) for pay with an organization or company
3. Self-employed full time (35 hours or more per week)
4. Self-employed part time (less than 35 hours per week)

*Answers in columns:*

1. Yes
2. No

- Do any of the following currently describe you?

*Select one answer from each row.*

*Employment status in rows:*

1. Looking for work
2. Unable to work due to a disability or work-related injury
3. On temporary layoff from a job

*Answers in columns:*

1. Yes
2. No

- Do any of the following currently describe you?

*Select one answer from each row.*

*Employment status in rows:*

1. Retired
2. A student
3. A stay-at-home spouse or partner
4. Working in an unpaid job, such as an internship or volunteer position
5. Working as a freelancer or independent contractor for pay

*Answers in columns:*

1. Yes
2. No

- Think about the industry in which you currently work. Which of the following industries is it?

*Select one answer only.*

11. Farming/Agriculture, Forestry, Fishing and Hunting, and Animal Production
21. Mining, Quarrying, and Oil and Gas Extraction
22. Utilities, Waste Management, and Remediation Services
23. Construction and Specialty Contractors (such as Plumbing and Electrical)
24. Administrative and Support Services (such as Call Centers, Security, Landscaping, and Janitorial)
- 31-33. Factory, Manufacturing, and Woodworking
42. Wholesale Trade
- 44-45. Retail/Stores/Shopping (including Online Retail)
- 48-49. Delivery Services, Warehousing, and Transportation (including Air, Rail, Water, Truck, and Passenger)
51. Information (including Publishing, Media, Telecom, Internet Search, and Social Networking)
52. Finance, Banking, and Insurance
53. Real Estate and Property Management
54. Professional, Scientific, Technical, and Business Services (including Engineering, Architecture, Law, Research, Marketing, Advertising, PR, and Veterinary)
55. Management of Companies and Enterprises
60. Child Day Care Services
61. Education and Tutoring
62. Health Care (including Elder Care, Home Health Care)
71. Arts, Entertainment, and Recreation (including Fitness and Gambling)
72. Accommodation and Food Services (including Hotels, Restaurants, and Bars)
80. Repairs and Maintenance
81. Personal Services (including Beauty, Pet Care, and Household)
82. Community/Non-Profit Organizations (including Religious and Political Organizations)
92. Public Administration and Public Safety (including Police and Fire Fighters)
93. Armed Forces

- And, which of the following best describes the industry in which you currently work?

*Select one answer only.*



311000. Food Manufacturing  
321000. Wood Product Manufacturing  
323000. Printing and Related Support  
Activities 325400. Pharmaceutical and  
Medicine Manufacturing  
326000. Plastics and Rubber Products  
Manufacturing  
332000. Fabricated Metal Product  
Manufacturing 333000. Machinery  
Manufacturing  
334000. Computer and Electronic Product Manufacturing  
335000. Electrical Equipment, Appliance, and Component  
Manufacturing  
336000. Transportation Equipment Manufacturing  
339000. Other Manufacturing

- What is your job title?

**[TEXTBOX]**

The next few sections will ask you questions about your current job and your career goals. When was the last time you:

*Statements in random order (record order):*

- a. Received a wage increase
- b. Received a promotion
- c. Lost a job
- d. Changed employers

*Answers:*

1. Within the last year
2. 2-3 years ago
3. 3-5 years ago
4. More than 5 years ago
5. Never

### **Questions categorized under Time and cost factor from the model**

- Please indicate whether each statement below applies to you.

*Statements:*

- a. I have been required by my employer to complete mandatory training in the past year.

- b. My employer has offered optional training opportunities to me in the past three years.
- d. In general, my employer pays for training.
- e. I am able to take time off during work hours to pursue learning activities.

*Answers:*

- 1. Yes
- 2. No

- You indicated your employer has offered optional training opportunities to you in the past three years. Did you participate in at least one of these optional training opportunities?

- 1. Yes
- 2. No

### **Questions categorized under Skill requirement factor from the model**

- Please indicate the extent to which you agree or disagree with each of the following statements:

*Statements in random order (record order):*

- a. My job requires that I learn new things.
- b. My job involves a lot of repetitive work.
- c. My job requires a high level of skill.

*Answers:*

- 1. Strongly disagree
- 2. Disagree
- 3. Somewhat disagree
- 4. Neither agree nor disagree
- 5. Somewhat agree
- 6. Agree
- 7. Strongly agree

### **Questions categorized under Work attachment factor from the model**

- Please indicate the extent to which you agree or disagree with each of the following statements:

*Statements in random order with 4 always last (record order):*

- a. I feel myself to be a part of my company.
- b. In my work I like to feel that I am making some effort not just for myself, but for the organization as well.

- c. The offer of a bit more money with another employer would not seriously make me think of changing my job.
- d. I am worried about the possibility of being fired.

*Answers:*

1. Strongly disagree
2. Disagree
3. Somewhat disagree
4. Neither agree nor disagree
5. Somewhat agree
6. Agree
7. Strongly agree

### **Questions categorized under Job satisfaction factor from the model**

- How satisfied are you with this aspect of your job:

*Statements in random order (record order):*

- a. The amount of pay and fringe benefits I receive.
- b. The amount of personal growth and development I get in doing my job.
- c. The amount of challenges in my job.

*Answers:*

1. Extremely dissatisfied
2. Dissatisfied
3. Slightly dissatisfied
4. Neutral
5. Slightly satisfied
6. Satisfied
7. Extremely satisfied

### **Questions categorized under Job security factor from the model**

- Please indicate the extent to which you agree or disagree with each of the following statements:

*Statements in random order (record order):*

- a. I have a high level of expertise and skill in my occupation.
- b. I feel confident in my ability to do my job.
- c. I am satisfied with my performance on the job.

*Answers:*

1. Strongly disagree
2. Disagree

3. Somewhat disagree
4. Neither agree nor disagree
5. Somewhat agree
6. Agree
7. Strongly agree

### **Questions categorized under Career Oriented factor from the model**

- Please indicate the extent to which you agree or disagree with each of the following statements:

*Statements in random order (record order):*

- a. I have clear career goals.
- b. I know what I need to do to reach my career goals.
- c. I regularly stay up-to-date about possible job opportunities.
- d. I have interesting career advancement opportunities at my current employer.

*Answers:*

1. Strongly disagree
2. Disagree
3. Somewhat disagree
4. Neither agree nor disagree
5. Somewhat agree
6. Agree
7. Strongly agree

The next few sections will ask about your attitude towards training and other development activities.

### **Questions categorized under Transfer success factor from the model**

- Please indicate the extent to which you agree or disagree with each of the following statements:

*Statements in random order (record order):*

- a. I am interested in participating in learning, training, and development activities.
- b. I feel favorably toward the idea of improving my career skills.
- c. I am able to transfer the skills learned in training courses back to my job.
- d. I have changed the way I work in order to be consistent with the material taught in training courses.
- e. Other people have told me that my performance has improved following a training course.

*Answers:*

1. Strongly disagree

2. Disagree
3. Somewhat disagree
4. Neither agree nor disagree
5. Somewhat agree
6. Agree
7. Strongly agree

### **Questions categorized under Professional support factor from the model**

- Please indicate the extent to which you agree or disagree with each of the following statements:

*Statements in random order (record order):*

- a. My organization actively supports my career development.
- b. My supervisor brings up opportunities for development in our conversations.
- c. My co-workers believe that learning and training activities are important.

*Answers:*

1. Strongly disagree
2. Disagree
3. Somewhat disagree
4. Neither agree nor disagree
5. Somewhat agree
6. Agree
7. Strongly agree

### **Questions categorized under Self-efficacy factor from the model**

- Please indicate the extent to which you agree or disagree with each of the following statements:

*Statements in random order (record order):*

- a. My past experiences with the school have been positive.
- b. I enjoy learning new things
- c. When facing difficult tasks, I am certain that I will accomplish them.
- d. I believe I can succeed at most any endeavor to which I set my mind.
- e. Compared to other people, I can do most tasks very well.

*Answers:*

1. Strongly disagree
2. Disagree
3. Somewhat disagree
4. Neither agree nor disagree

5. Somewhat agree
6. Agree
7. Strongly agree

Each of the following questions presents two different kinds of training opportunities. Please indicate which of the opportunities you would prefer -- if you had to make a choice between them.

In answering each question, assume that everything else about the opportunities is the same. Pay attention only to the characteristics listed.

**Training A: A course that would help me do my current job better.**

**Training B: A course that could potentially lead to a promotion.**

1. Strongly prefer A
2. Slightly prefer A
3. Neutral
4. Slightly prefer B
5. Strongly prefer B

Each of the following questions presents two different kinds of training opportunities.

Please indicate which of the opportunities you would prefer -- if you had to make a choice between them.

In answering each question, assume that everything else about the opportunities is the same. Pay attention only to the characteristics listed.

**Training A: A course that would help me do my current job better.**

**Training B: A course that could potentially lead to a different job.**

1. Strongly prefer A
2. Slightly prefer A
3. Neutral
4. Slightly prefer B
5. Strongly prefer B

Each of the following questions presents two different kinds of training opportunities.

Please indicate which of the opportunities you would prefer -- if you had to make a choice between them.

In answering each question, assume that everything else about the opportunities is the same. Pay attention only to the characteristics listed.

**Training A: A course that would teach me more about my field in general.**

**Training B: A course that would teach me more about specific skills in my field.**

1. Strongly prefer A
2. Slightly prefer A
3. Neutral
4. Slightly prefer B
5. Strongly prefer B

Each of the following questions presents two different kinds of training opportunities.

Please indicate which of the opportunities you would prefer -- if you had to make a choice between them.

In answering each question, assume that everything else about the opportunities is the same. Pay attention only to the characteristics listed.

**Training A: A course that would teach more about non-technical skills such as communication.**

**Training B: A course that would teach me more technical skills.**

1. Strongly prefer A
2. Slightly prefer A
3. Neutral
4. Slightly prefer B
5. Strongly prefer B

Each of the following questions presents two different kinds of training opportunities.

Please indicate which of the opportunities you would prefer -- if you had to make a choice between them.

In answering each question, assume that everything else about the opportunities is the same. Pay attention only to the characteristics listed.

**Training A: A course that is taught by one of my co-workers.**

**Training B: A course that is taught by an instructor I don't know.**

1. Strongly prefer A
2. Slightly prefer A
3. Neutral
4. Slightly prefer B
5. Strongly prefer B

Each of the following questions presents two different kinds of training opportunities.

Please indicate which of the opportunities you would prefer -- if you had to make a choice between them.

In answering each question, assume that everything else about the opportunities is the same. Pay attention only to the characteristics listed.

**Training A: A course that is taught online.**

**Training B: A course that is taught in person.**

1. Strongly prefer A
2. Slightly prefer A
3. Neutral
4. Slightly prefer B
5. Strongly prefer B

Each of the following questions presents two different kinds of training opportunities.

Please indicate which of the opportunities you would prefer -- if you had to make a choice between them.

In answering each question, assume that everything else about the opportunities is the same. Pay attention only to the characteristics listed.

**Training A: An after-hours course that is taught at my work site.**

**Training B: An after-hours course that I could take from home.**

1. Strongly prefer A
2. Slightly prefer A



3. Neutral
4. Slightly prefer B
5. Strongly prefer B