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The Relationship Between Middle Managers' Self-Determination and Lean Implementation in Manufacturing

Andrea K. Hopf
Walden University

Walden University

College of Management and Human Potential

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Andrea K. Hopf

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Review Committee
Dr. Meridith Wentz, Committee Chairperson, Doctor of Business Administration Faculty

Dr. Isabel Wan, Committee Member, Doctor of Business Administration Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
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Abstract

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MBA, University of Mississippi, 2012

BS, North Dakota State University, 2008

Doctoral Study Submitted in Partial Fulfillment

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Abstract

Although middle managers' commitment to lean implementation affects successful improvement outcomes in the United States, most senior leaders in manufacturing attempting to implement lean in the United States fail to achieve expected improvement outcomes. Grounded in the self-determination theory of motivation, the purpose of this quantitative correlational study was to examine the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation. Participants were 77 midlevel managers in manufacturing organizations in the midwestern United States. Data were collected using the Basic Psychological Need Satisfaction at Work Scale. The results of the multiple regression analysis indicated the model could statistically significantly predict the level of lean implementation, $F(3, 73) = 4.521$, $p < .01$, $R^2 = .157$. Relatedness was the only significant predictor ($p = .043$, beta = .270). A key recommendation for senior manufacturing leaders is to foster an environment where employees fully internalize tasks and feel that their assignments are consistent with their core beliefs. The implications for positive social change include the potential for middle managers to improve work-life balance, job satisfaction, emotional health for manufacturing employees, and job sustainability within their communities.

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Dedication

I would like to dedicate this paper to my parents, who have supported all my wild hairs throughout my life. You raised me from a child who believed that higher education was not an option to becoming an adult who yearns to learn new things continually and stretch myself beyond what I thought was possible. A special dedication and shout out as well to my partner in crime, Brad. Thank you for your patience and for giving me the time and space I needed at times to make this dream a reality. I hope to never stop learning the invaluable life skills and lessons from you that a person could never gain from inside a classroom or textbook. I love you!

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I would like to thank my family. My number one support system for my entire life. My parents, who have always believed I could do anything, even if I did not believe so myself. My sister, who is someone I have always wanted to live up to and a large part of the reason I embarked on this journey in the first place. My uncle, Clark, who has been a huge inspiration throughout my entire education and career path and someone who just "gets" the way I think. And all my extended family, including the Blobaums, for constant words of encouragement that kept me going.

I would like to thank my professional network. Notably, Chris Winans, who enthusiastically encouraged me to "go for it," always supporting my goals and believing in me. Chris was a natural leader who saw every opportunity as a growth and learning opportunity. He truly set a bar for meeting self-determination needs of employees. Thank you, Chris. Also, thank you to the mid-level managers within my professional network who volunteered their time and opinions for this study. Without the data, I could not have completed my research!

Finally, I would like to thank the Walden University academic staff. Pamm Kemp, my advisor, for regular check-ins and enthusiastic encouragement. I could always tell Pamm was vested in my success throughout the program. All my instructors throughout the program, each from whom I learned and grew in my research and writing abilities. And finally, to Dr. Meridith Wentz, my committee chair, for her insights, guidance, patience, and timely responses to the many questions and drafts that I submitted along the way. You helped keep me grounded and on track!

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Section 1: Foundation of the Study

In this section, I provide a background of the problem under study before presenting the general business problem, the specific business problem, and the purpose of this study. The population, sampling, and nature of the study are briefly addressed, culminating in the research question and hypotheses. I introduce the theoretical framework used to guide this study; define operational terms; and discuss assumptions, limitations, delimitations, and the significance of this study for the business and social communities. This section is concluded with an exhaustive literature review of motivational theories, including self-determination, and the impact of continuous improvement and lean practices on an organization and its people to demonstrate the importance of this topic and expose the gap that I aimed to address by conducting this study.

Background of the Problem

Change management is imperative for successful and sustainable change initiatives; however, up to 70% of initiatives requiring change within organizations fail (Wetzel & Dievernich, 2014). New technology and competition require management to embrace change in their strategic planning to gain a competitive advantage (Veselinović et al., 2021). Change for competitive advantage in manufacturing can consist of continuous improvement and lean initiatives. In a case study of two organizations implementing lean, Rymaszewska (2017) found that successful continuous improvement efforts depend on support from top management and alignment of these efforts with capabilities, resources, goals, and the long-term vision.

Additionally, understanding and using effective leadership styles is essential for leaders at all levels of the organization through the lean implementation process. For middle managers, experts recommended beginning the journey with highly task-focused leadership and transitioning to higher relation-focused leadership in later implementation phases (Tortorella et al., 2017). However, Tortorella et al. (2019) found that there was a misalignment between recommended and actual leadership styles; in this context, the level of adoption can mediate a middle manager's leadership style.

Motivational factors contribute to the level of adoption of change and innovation. For instance, being recognized for their efforts and receiving appropriate compensation for what they delivered motivated knowledgeable employees (Sun, 2021). Martinsen and Furnham (2019) addressed students' motivation with an explorer versus assimilating mindset, where those with explorer mindsets performed better at complex and insightful problem-solving when they had lower self-competence beliefs. Employees' mindsets are influential to the success of innovation when they can connect problems, questions, and ideas; challenge the status quo; observe cross-functional behaviors and processes; experiment; and network with others (Kahn, 2018). Therefore, a study on middle managers' motivation to implement lean in manufacturing for competitive advantage was relevant due to their influence as leaders.

Problem and Purpose

Successful management of lean implementation requires involvement and engagement from all levels of the organization, including middle managers who have a pivotal role in affecting change (Jing et al., 2020). Organizations attempting to implement

lean practices in the United States have a 75% failure rate in reaching expected levels of improved performance (Maware & Parsley, 2022). The general business problem was that although middle managers' commitment to lean implementation affects successful improvement outcomes in the United States, most organizational leaders attempting to implement lean in the United States fail to achieve expected improvement outcomes. The specific business problem was that some manufacturing leaders in the United States do not know the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation.

The purpose of this quantitative correlational study was to examine the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation. The independent variables were competence, relatedness, and autonomy, and the dependent variable was level of lean implementation. The study population included middle managers of manufacturing operations in the midwestern United States. The implications for positive social change include strengthening the abilities and engagement of human capital, sustaining manufacturing facilities to continue providing jobs, and fostering the concept of working smarter versus harder so that employees could realize a satisfying work-life balance.

Population and Sampling

The population from which the sample was drawn included middle managers of manufacturing organizations in the midwestern United States. Middle managers included, but were not limited to, plant managers, production managers, quality managers, and continuous improvement managers. I used nonprobabilistic, purposive sampling to obtain

survey participants from the specified population. Purposive sampling techniques improve credibility and dependability through specific inclusion and exclusion criteria for participants (Campbell et al., 2020). To participate in the current study, middle managers needed to have direct responsibilities over manufacturing operations. Middle managers of other functions, front-line employees, supervisors, and executives were excluded from this study.

I used the G*Power Version 3.1.9.7 software to conduct an a priori sample size analysis using the *F* test and multiple linear regression for this study. Parameters for this calculation included a medium effect size ($f^2 = 0.15$), a standard alpha value ($\alpha = 0.05$), and three predictor variables. The results indicated that for a statistical power of 0.80, I needed to obtain responses from 77 participants. According to Wu et al. (2022), the average response rate for online surveys is 44.1%. Based on these results, I planned on a minimum sample size of 175 participants and continued recruiting participants until I reached 77 responses. I gained access to participants through LinkedIn and networking through other social media platforms and professional organizations as necessary.

Nature of the Study

The three research methodologies available to explore or examine various phenomena are quantitative, qualitative, and mixed methods (Sturgiss & Clark, 2020). Quantitative research is conducted through an objective lens, addressing relationships between independent and dependent variables using numerical data to substantiate hypotheses (Ellis, 2021). On the other hand, Ellis (2021) explained that qualitative research aims to understand the worldview of a few individuals. The qualitative method

did not fit the purpose of this study because I did not explore why individuals thought or felt a certain way. Mixed-methods research consists of the use of both qualitative and quantitative data to understand phenomena (Harrison et al., 2020). Harrison et al. (2020) noted the length of mixed-methods studies as a limitation of this approach. Since I did not conduct qualitative research, a mixed-methods approach was inappropriate. This study consisted solely of quantitative research to examine the relationship between independent and dependent variables.

Experimental and quasi-experimental designs use independent and dependent variables (Saunders et al., 2016). Experimental studies allow the researcher to adjust independent variables to observe the effects of these changes on the dependent variable (Bougie & Sekaran, 2020). I did not use an experimental design in this study because I did not manipulate the independent variables. Conversely, a correlational design allows the researcher to examine the relationships among data (Harrison et al., 2020). Since I examined the relationship between competence, relatedness, autonomy, and successful lean implementation, I used a correlational design.

Research Question and Hypotheses

RQ: What is the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation?

H_0: There is no significant relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation.

H_1: There is a significant relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation.

Theoretical Framework

Edward Deci (1971) first developed the self-determination theory (SDT) in the 1970s to examine the impact of intrinsic motivation when monetary compensation was introduced to participants performing a task. SDT further evolved in the 1980s to specifically address competence, relatedness, and autonomy as the specific intrinsic motivators among individuals in a work setting (Deci et al., 1989). These three factors were identified as basic needs for individual growth, development, and well-being. Recognizing that not all activities at work are intrinsically motivating, Deci et al. (1994) proposed that individuals must integrate the activity with their belief systems and values to foster self-regulation. Satisfying the three needs identified in SDT promotes creativity, job satisfaction, positive work-related attitudes, and organizational citizenship behavior (OCB; Gagné & Deci, 2005). Furthermore, self-regulation and integration leverage employees' knowledge and capabilities versus objectification (Ryan et al., 2021). Using SDT as the theoretical framework allowed me to examine the relationship between each of the three needs (i.e., competence, relatedness, and autonomy) and workplace performance outcomes, specifically the level of lean implementation.

Operational Definitions

Defining, measuring, analyzing, improving, and controlling (DMAIC): A step-by-step, gated framework used frequently in six sigma applications for a fact-based approach to solving problems (Sokovic et al., 2010).

Gemba: Japanese term for "the real place"; a physical location where the work is actually occurring; for example, a manufacturing shop floor, construction site, or sales floor (Imai, 1997).

Kaizen: Japanese term for "change" (kai) and "good" (zen); a people-centered and process-oriented approach to continuous improvement (Wittenberg, 1994).

Assumptions, Limitations, and Delimitations

Assumptions

Research comprises many philosophical, ontological, and epistemological assumptions, which are personally held beliefs and perceptions that generally drive methodological choice (AbuRaya & Gomaa, 2020). I made five key assumptions in this study. The first assumption was that all participants understood what lean implementation is. I assumed that participants understood where their manufacturing facility fits among various levels of lean implementation. Another assumption was that a purposive sample of participants with access to the online survey was representative of the population. I also assumed that I had a large enough sample size of participants to accurately reject or fail to reject the null hypothesis. My final assumption was that all participants answered the survey questions honestly and accurately.

Limitations

Research limitations provide transparency to stakeholders and may improve their understanding and application of the findings (Shahriari & Rasuli, 2020). The first limitation of this study was the potential for researcher bias due to my nearly 15 years of experience in the lean implementation and continuous improvement field. Limitations

also existed with the demographics of the study's population, addressing only the middle managers of manufacturing organizations, regardless of size, in one region of the United States. Additional limitations were present with the data collection method. Since I solicited participation through LinkedIn and other online professional groups, I did not have direct access to qualified individuals who did not participate in these online forums.

Delimitations

Delimitations involve specifying the scope and boundaries of a study, increasing the validity and reliability and preventing researchers from drifting from, or reframing, the study's purpose after data are collected and analyzed (Coker, 2022). The two delimitations in this study included the job position and geographic regions of participants. I selected only middle managers as participants for this study and excluded front-line employees, supervisors, and executives. Additionally, I only surveyed participants in the Midwest region of the United States. Recent research in the Midwest region included Illinois (Han et al., 2022), Ohio (Willen et al., 2022), Michigan, Minnesota, Wisconsin (Beck et al., 2022), Indiana, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota (Zhou et al., 2021). This study was bound by the states listed here.

Significance of the Study

A goal of research is to generate impactful knowledge on a particular topic that could create value for individuals and organizations. The significance of this study includes its contribution to business practice and implications for social change. The

concepts discussed in the following subsections added to existing literature and research on continuous improvement in a business environment.

Contribution to Business Practice

This study may provide manufacturing leaders with insightful strategies for increased levels of lean implementation. Lean implementation equips business leaders with the ability to improve quality and reduce waste in processes (Krupa et al., 2022). Furthermore, lean implementation has a statistically significant relationship with competitive quality advantage, environmental performance, and overall business performance (Agyabeng-Mensah et al., 2020). Yet, researchers have continued to find reasons why lean implementation fails at various stages throughout the journey (Sunder & Prashar, 2020). Understanding if middle managers' competence, relatedness, and autonomy correlate with the levels of lean implementation will contribute to the existing literature for business practice and provide leaders with insight into the impact of these motivation factors on business performance.

Implications for Social Change

Increased levels of lean implementation could also positively impact social change. The Toyota Production System (TPS) is a common framework for lean practices and incorporates motivating and engaging all employees in manufacturing (Jönsson & Schölin, 2014). Furthermore, self-determination in the workforce fosters autonomy over control (Gagné & Deci, 2005), encouraging leaders to capitalize on employee knowledge, empowerment, and engagement (Ryan et al., 2021). Treating employees like humans versus machines could increase job satisfaction and overall emotional health. Similarly,

improving quality and efficiency through lean implementation may enable employees to find a more reasonable work-life balance. The resulting profitability from sustained lean implementation also may ensure the organization's longevity and jobs within the community.

A Review of the Professional and Academic Literature

To better understand the current state of research among the topics under study, I conducted a literature review framed around motivation; self-determination, including competence, relatedness, and autonomy; leadership; and a variety of continuous improvement approaches, including lean manufacturing. I primarily used publications databases accessible through the Walden University Library, including ProQuest Central, EBSCOHost, ScienceDirect, Emerald Management, and the Directory of Open Access Journals. The following keywords search terms were used: *self-determination*, *competence*, *relatedness*, *autonomy*, *motivation*, *middle managers*, *continuous improvement*, *lean implementation*, *lean manufacturing*, *six sigma*, *statistical process control*, *Toyota Production System*, *TPS*, *Total Preventive Maintenance*, *TPM*, *Total Quality Management*, and *TQM*. This literature review consists of 155 sources, with 121 (78%) published between 2020 and 2023. Of the 155 total sources, 133 (85%) were retrieved from peer-reviewed journals. The literature review is structured as follows: an application to the applied business problem, motivation, motivational theories, self-determination theory, competence, relatedness, autonomy, motivation and leadership, motivation and organizational citizenship behavior, continuous improvement, innovation (product innovation and process innovation), lean implementation, TPS, and alternate

continuous improvement approaches (six sigma, statistical process control, Total Preventive Maintenance [TPM], and Total Quality Management [TQM]).

Application to the Applied Business Problem

The purpose of this quantitative correlational study was to examine the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation. The null hypothesis was "there is no significant relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation." The alternative hypothesis was "there is a significant relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation." As opposed to motivation theories developed by Maslow, Herzberg, and Alderfer that addressed basic human needs (Dinibutun, 2012), SDT applies to workplace factors (Deci et al., 1989). Middle managers' competence, relatedness, and autonomy may have a relationship with the level of lean implementation; therefore, organizational leaders who understand this relationship may have a heightened ability to make informed decisions that could lead to higher levels of lean implementation.

Motivation

Many factors can motivate individuals, influencing what they do, say, believe, or how they act. Subconscious motivation may impact individuals' ability to remember the face of someone they have just met (Fan et al., 2022). Extrinsic motivation, like financial rewards or evaluative threats, and intrinsic motivation, like perceived competence, could motivate the effort individuals exert while listening (Carolan et al., 2022). Inclusion in a social group could motivate individuals to partake in regular physical activity (Dėdelė et

al., 2022). These examples included motivational sources that were unknown, external, or internal, and each of the activities in these studies led to a happier and healthier lifestyle when individuals were motivated to engage. However, these researchers also found that knowledge of the lifestyle benefits was insufficient to inspire individuals to participate in the activities.

Motivation can also positively impact individuals in the workplace, regardless of environmental factors. Lohela-Karlsson et al. (2022) found that individuals with high work motivation who were experiencing health-related or work environment problems had less productivity loss than their counterparts with less work motivation. Similarly, self-control motivation in the morning could positively influence task performance in the afternoon after working on adverse tasks in the morning (Wilken et al., 2022). Furthermore, managers have a responsibility to elicit motivation among others. Effective managers may motivate their subordinates through strategic communication based on task-assignment fit (Jansen et al., 2022). Whether the motivation is derived intrinsically or extrinsically, achieving individual and organizational goals is necessary.

Motivational Theories

Theorists have purported various underlying reasons why individuals may or may not participate in various tasks or activities. Maslow, Alderfer, and Herzberg theorized that motivation was derived from need fulfillment in a hierarchical structure, where basic physiological needs must be met before individuals become motivated by higher level needs, such as personal growth and achievement (Dinibutun, 2012). Other theorists, including McGregor (2000), Vroom (Dinibutun, 2012), and Ryan et al. (2021), studied

work motivation under the assumption that either the lowerlevel needs were already met or they were not relevant factors to motivation at work. Table 1 contains a taxonomy of several motivational theories.

Table 1

Motivational Theory Taxonomy

Theory	Year introduced	Theorist/author	Key components
Maslow's hierarchy of needs	1943	Abraham Maslow	Maslow (1948) theorized that motivation was driven by need satisfaction in a hierarchy from physiological needs at the bottom (food, water, safety) to higher-level needs, including love, esteem, and self-actualization toward the top. Maslow found that as each need up the hierarchy was fulfilled, the need would dissipate, the next level need would become present, and character traits of individuals would evolve based on need satisfaction.
Motivator-hygiene theory	1959	Frederick Herzberg	Herzberg et al. (1959) differentiated sources of dissatisfaction (hygiene factors, such as work conditions and benefits) from sources of satisfaction (motivation factors, such as achievement and recognition). They identified that dissatisfaction was not the opposite of satisfaction. In other words, improving hygiene factors alone did not increase employee motivation in the workplace. Grigaliunas and Herzberg (1971) later tested the repeatability of the motivator-hygiene theory. They found that qualitative research mirrored findings from the original theory. In contrast, quantitative research only did so when items were ranked as irrelevant if not applicable versus instituting forced ranking in the survey.
Theory X and Theory Y	1960	Douglas McGregor	McGregor (2000) expanded on Maslow's hierarchy of needs to explain why industrial workers were motivated less through coercion and more through managers facilitating an environment for workers to achieve their full potential. McGregor called the conventional view of management through coercion due to an inherent indifference of workers "Theory X." In contrast, McGregor suggested that indifference, or even resistance, resulted from a directive management style versus a cause. Conversely, McGregor noted that the higher-level needs of industrial workers required managers to facilitate motivation by creating conditions for employees to realize their personal goals to achieve organizational goals and called this "Theory Y." McGregor (1967) found that if employees perceived their targets as realistic, they would accept and comply with necessary changes.
Vroom's expectancy theory	1964	Victor Harold Vroom	Vroom and Maier (1961) identified gaps from earlier motivation researchers, whose focus was the impact of environmental factors on individuals, resulting in theoretical propositions that were not necessarily congruent with industrial settings. The expectancy theory was proposed as

Theory	Year introduced	Theorist/author	Key components
			within-person decision-making based on an individual's perceived benefit from partaking in an activity (Pinder, 2007).
Alderfer's ERG theory of motivation	1969	Clayton P. Alderfer	Schneider and Alderfer (1973) addressed the hierarchy of needs relevant to the workplace. The existence, relatedness, and growth (ERG) theory followed a similar hierarchy to Maslow's hierarchy of needs. However, Schneider and Alderfer found that the ERG theory was more applicable in organizational settings than Maslow's theory, which incorporated lower-level physiological needs. Alderfer (1967) tested the concepts of the ERG theory through interviews and questionnaires from a perspective of need satisfaction and need desire. Alderfer found that the ERG theory had higher validity when researched based on need satisfaction versus need desire.
Self-determination theory	1985	Edward Deci & Richard Ryan	Under the assumption that individuals within the workforce were seeking higher-level needs satisfaction, Ryan et al. (2021) expanded upon earlier motivational theories that incorporated lower-level physiological needs. Specifically, Ryan and Deci (2000) developed the self-determination theory, purporting that individuals in the workforce were motivated by competence, relatedness, and autonomy.

Motivation is a thoroughly researched and theorized topic. Throughout the 20th century, researchers built upon suppositions of theorists who came before them to build upon earlier motivating factors, demonstrating their value in the workplace and a society that has evolved (McGregor, 2000; Schneider & Alderfer, 1973; Vroom & Maier, 1961). Most recently, self-actualization from Maslow's hierarchy of needs was positively correlated with the need fulfillment of the SDT (Kaufman, 2023). Kaufman (2023) found that self-actualized individuals had higher levels of curiosity, creativity, and well-being as well as improved workplace outcomes.

SDT

The SDT is one theory among numerous others explaining the motivation of human subjects. In SDT, researchers focused on three needs to facilitate motivation within individuals striving for growth, social development, and well-being: competence, relatedness, and autonomy (Ryan & Deci, 2000). This theory was built under the

assumption that it is part of natural human nature for individuals to want to learn and grow in their capabilities of being self-regulated (Ryan et al., 2021). Compared to earlier hierarchical models, the proposition suggested by SDT was that individuals in the workforce already have fulfilled basic physiological needs.

The main differentiator between SDT and other motivational theories is the focus on autonomy (Schüler et al., 2019). Autonomy is often misconstrued as a term to indicate isolation or working alone (Ryan & Deci, 2000). Ryan and Deci (2000) affirmed, on the contrary, that autonomy in the sense of SDT relates to an individual feeling self-regulated in their decision making versus controlled by external forces. Tóth-Király et al. (2020) discovered the importance of balanced fulfillment of all three needs to a high degree, and contrastingly, an imbalance of needs could lead to the neglect of factors if more time and energy are exerted toward only one. Thus, relatedness and competence are only fully fulfilled if supported by autonomy within the individual's environment.

Early studies on motivation in the context of SDT developed from understanding the impact of external factors on intrinsic motivation, which was the basis of the cognitive evaluation theory (Gagné & Deci, 2005). Intrinsic motivation, in this context, was understood as an individual's desire to participate in an activity for sheer enjoyment. In a lab study, Deci (1971) confirmed that intrinsic motivation was diminished when monetary compensation was introduced for completing the activity versus enhanced when individuals received verbal affirmation. Although this theory is applicable in many scenarios, Deci assumed that individuals begin carrying out tasks through intrinsic motivation. However, Gagné and Deci (2005) noted the flaw that individuals are already

receiving compensation in a work environment, and there is a high likelihood that some of the tasks required for a job are not stimulating enough to generate intrinsic motivation.

Researchers set out to determine factors from the viewpoint of optimally motivating individuals when the conditions of intrinsic motivation are not always present. Through this lens, Ryan and Deci (2000) identified a continuum of extrinsic motivation and the effects on an individual's commitment and authenticity toward activities. External regulation is on the far left of the continuum, and it represents the highest level of external control, indicating that an individual is performing the activity for the sole purpose of receiving a reward or avoiding a punishment. Introjected regulation represents slightly less control over an individual, where they perform the activity for pride or to avoid guilt but still do not fully internalize it. Individuals who experience identified regulation begin to own responsibility for the activity and understand its importance. Finally, the most autonomous regulation on the continuum is integrated, where the activity is fully internalized and consistent with the values and needs of an individual. Deci et al. (1994) found that supporting the transition from introjected to integrated regulation required at least two of the following three factors: (a) providing a rationale that is meaningful to the individual, (b) acknowledging the individual's perspective that the activity is not enjoyable but essential, and (c) using rhetoric consistent with choice (e.g., "if you would like to get started") versus control (e.g., "start now"). This evolution has increased the theory's applicability in work settings.

The digital world has grown more prominent over the last several years and even more so because of the COVID-19 pandemic. SDT has been used to evaluate the

motivation of students and consumers in this context. For instance, researchers who conducted an analysis of student essays regarding their online learning experience uncovered positive correlations between autonomy, competence, and satisfaction in their courses, with less satisfaction regarding relatedness with instructors and other students (Salikhova et al., 2021). Conversely, online leisure activities, such as using Facebook and gaming, resulted in a higher satisfaction in relatedness than competence and autonomy compared to high levels of satisfaction among all three factors (Tóth-Király et al., 2020). From a consumer standpoint, online retailers' telepresence and social presence were found to provide positive customer experiences along the realms of autonomy and relatedness, leading to greater purchase intentions (Gao et al., 2018). Similarly, quality information and service provided online by banking institutions facilitated user satisfaction through intrinsic and extrinsic identified regulations, increasing consumers' continued use of online banking (Rahi & Ghani, 2019). These researchers addressed optimal ways providers of online products and services could increase users' autonomy, competence, relatedness, and motivation to act.

Another common theme for studies grounded in SDT related to the workforce is generating employees' passion and love for their work. Beyond satisfaction, pure love for the job requires intrinsic motivation and comes from being challenged, fully committed, and developing relationships with others (Bygrave, 2020). These themes are akin to competence, autonomy, and relatedness from the SDT. Bygrave (2020) found that love for the job positively impacts employee well-being and turnover intention; however, there is not a direct correlation between love of a job and productivity, assumingly due to

productivity requiring some external regulation. On the other hand, Thibault-Laundry et al. (2018) found that passion at work facilitated by job autonomy, task variety, meaningful work, and clear job descriptions resulted in positive outcomes for turnover intention, OCB, and performance. The correlation between SDT motivational factors and performance is inconclusive and has not been studied regarding adopting performance-enhancing initiatives.

In SDT, Ryan and Deci (2000) addressed the varying levels of extrinsic motivation from being externally regulated to fully integrated within individuals and intrinsic motivation driven by competence, relatedness, and autonomy. Considering that the adoption rate of lean implementation and lean management in the United States is currently around 25% (Jing et al., 2020; Maware & Parsley, 2022), there is an assumption that lean initiatives are not entirely intrinsically motivating. In SDT, Ryan and Deci believed that higher levels of competence, relatedness, and autonomy facilitated higher extrinsic motivation. Therefore, the SDT was relevant for examining the correlation between competence, autonomy, relatedness, and the adoption of lean initiatives among middle managers.

Competence. Competence involves the knowledge and abilities individuals possess to perform a job (Igielski, 2020). Researchers have found that stakeholders identify different competencies as critical for a position, including internal coherence, interpersonal communication, and leadership in addition to technical abilities, which could all be enhanced through education and experience (Soltysik et al., 2020; Warshawsky et al., 2022). However, an individual's actual ability to perform a task well

could differ from their personal belief regarding how well they could perform the task. For instance, individuals who demonstrate the ability to separate emotional reactions from a clear, conscious focus on actual events and circumstances could have a higher sense of competence on the job, resulting in higher engagement at work (Chen et al., 2022). Researchers collecting data through surveys or questionnaires are more likely to receive figures related to perceived competence if participants are self-reporting. Misalignment could exist between actual and perceived competence as evident by the resulting performance (Kiss et al., 2022). In one study, Johnson et al. (2022) found that self-reported competence changed after youth participants performed a task and again after they were able to view their performance from an outsider's perspective. In this case, actual competence was closest to self-reported competence after the participants viewed their performance. Additionally, there is evidence that perceived competence could more closely relate to actual competence as an individual ages, possibly due to higher cognitive abilities than younger individuals (De Meester et al., 2020). Therefore, although bias could exist in participants self-reporting this attribute, the risk is minimized with adult participants.

Relatedness. Individuals have many types of relationships, including romantic, familial, friendships, acquaintanceships, and additional situational connections. Researchers have found a positive correlation between forming relationships with others (Booker et al., 2022; Schmidt et al., 2020), connecting with nature (Grabowska-Chenczke et al., 2022; Sadowski et al., 2022), and a sense of belonging that enhances overall satisfaction and well-being. A lack of connections could create loneliness, which Wax et

al. (2022) found was negatively related to individuals' OCB and commitment. Conversely, researchers have found positive relationships between relatedness and work outcomes, including increased engagement (Goštautaitė et al., 2022), intrinsic motivation, and lower turnover intention (Løvaas, 2020). However, I found no existing research during this literature review regarding the impact of relatedness on financial performance indicators, such as effective support and implementation of improvement initiatives.

Autonomy. Autonomy involves decision-making by impacted individuals (Hauk & Gröschner, 2022), also referred to as subjective freedom (Maimone Ansaldo Patti et al., 2021). Pedersen (2021) argued that autonomy went beyond individual decision-making as a relational phenomenon. Regardless of its specific nature, some researchers have discovered positive relationships between autonomy and psychological well-being (Clausen et al., 2022; Lachance-Grzela et al., 2022) and pro-social behavior (Collie, 2022), while the relationship between autonomy and business performance had mixed results (Voorn et al., 2022; Yu et al., 2019). The conflicting results of a relationship between autonomy and business performance required further research under specific contexts. There was a gap in the literature addressing this relationship specific to middle managers and the level of lean implementation.

Motivation and Leadership

Leaders play a pivotal role in the success of lean implementation. Leaders must support and drive continuous improvement efforts (Williams, 2021) while taking accountability and leading by example (Maware & Parsley, 2022). There are varying perspectives on the required leadership style to drive and sustain lean implementation.

Tortorella et al. (2017) concluded that lean implementation most appropriately begins with task-focused leadership. On the other hand, Da Costa Nogueira et al. (2018) determined that empowering leadership versus transactional, transformational, or directive leadership positively impacts lean implementation. Conversely, Chiarini and Brunetti (2019) found that empowerment does not affect lean implementation. Additionally, researchers suggested that the leader's adoption level and influence versus a specific style may lead to successful lean implementation efforts (Da Costa Nogueira et al., 2018; Tortorella et al., 2019). If leaders do not support, understand, or drive lean implementation, the efforts will likely fail regardless of the individual's leadership style.

Varying discoveries about what could motivate managers, in general, also exist. Middle managers are considered knowledge employees, who Sun (2021) indicated are motivated by compensation. However, the workforce comprises multiple generations of individuals with different motives (Henkel & Haley, 2020). Henkel and Haley (2020) found that project managers of varying demographics are most motivated by making a difference, being challenged, working with engaged employees, advancing within the company, receiving recognition, and gaining support from their superiors. Similarly, Jing et al. (2020) found that enhancing their reputation motivates middle managers more than the control of their senior managers. Jain (2022) discovered that a desire (affective identity) or feeling of responsibility (social normative) to lead could motivate middle managers in manufacturing and service sectors to exude professionalism, work commitment, and power-sharing. The extensive research on this topic was a testament to the necessity of motivation among leaders for effectiveness.

Motivation and OCB

Organizations rely on many stakeholders throughout the value chain for sustainability in business. Employees comprise an important stakeholder group, responsible for running the business operations, and their motivation at work could impact the commitment and loyalty to their organization. Employee motivation has positively impacted organizational commitment, which could mediate OCB of the employees (Suliati et al., 2022). Leaders' enactment of motivation-enhancing practices could strengthen this relationship, as employees might perceive support from the organization (Morales-Sánchez & Pasamar, 2020). However, if employees were motivated by avoiding negative consequences versus achieving positive outcomes, their motivation could lead to counterproductive behaviors (Pomerance et al., 2021). Thus, leaders motivated to achieve performance goals have a higher likelihood of demonstrating OCB.

Employees' OCB could have a positive and direct impact on the organization. When employees have high organizational commitment, demonstrated through OCBs, they could have a higher likelihood of achieving goals, positively impacting performance (Çelikt, 2022) and sustainability (Dai et al., 2022). Moreover, high organizational commitment could reduce productivity loss in high-stress work environments (Lohela-Karlsson et al., 2022). Conversely, low organizational commitment could have dire effects to the organization including employee narcissistic and psychopathic behaviors, where they may not have the inclination to report peers with counterproductive work behaviors (Lyons et al., 2022). Therefore, OCB plays a pivotal role between employee

motivation and positive work outcomes, including sustainable organizational performance.

Continuous Improvement

Continuous improvement is a novel concept for organizational leaders to ensure operations do not become stagnant, and it could lead to a competitive advantage. Continuous improvement advancements could include new technologies that aid operators with their tasks, which researchers found to significantly contribute to improved flow, efficiency, delivery, and employee well-being (Arica et al., 2022). Teams play a critical role in continuous improvement efforts (Arnaiz et al., 2022) and middle managers' continuous improvement support could mediate the relationship between their ability to exploit and explore knowledge and capabilities of team members and the resulting overall business performance (Alamsjah & Asrol, 2023). Leaders should understand the impact of continuous improvement on their organization and how they can support impending changes.

A common approach to continuous improvement is through kaizen. The kaizen philosophy consists of Japanese cultural attributes, such as persistence, a resistance to giving up, and making small, gradual improvements to reach perfection (Amalia, 2022). Aamer et al. (2022) found that critical success factors of kaizen, including organizational culture, employee participation, and initiative, were transferrable outside of Japan, its country of origin. Researchers have found that applying the kaizen philosophy could aid leaders in achieving improved productivity by 3% to 50%, increased sales and production volumes by approximately 30%, decreased nonconformances by 10%, decreased costs by

30%, decreased delays by 33%, and increased operational availability by 20% (Berhe, 2022; Bogdan et al., 2021; Govender & Dewa, 2022; Krupa et al., 2022; Matope et al., 2022). Furthermore, Bogdan et al. (2021) emphasized a bottom-up approach for identifying improvement opportunities and problem-solving. This philosophy goes beyond the tools and techniques to make continuous improvements, and it challenges leaders to foster a culture of innovation and lean techniques.

Midlevel managers play an important role in continuous improvement practices and should develop competencies to support their efforts. Their active engagement in improvement activities, including coaching team members, motivating others, and reviewing problem-solving progress, and trustworthiness could positively impact organizational continuous improvement capability (Fannon et al., 2022; Lleo et al., 2021). Additionally, Gärtner et al. (2022) recommended that middle managers should assign dedicated resources for exploration and exploitation, with integration between the two groups, to facilitate continuous improvement as a core competency. This strategy could enable leaders to effectively balance incremental and radical innovations.

Innovation

Innovation consists of doing something new and different. Innovations could classify as incremental or radical, closed or open, and relate to products or processes. Radical innovation may require organizational innovation capability, whereas incremental innovation could occur with less innovation capability and still enhance business performance (Yusof et al., 2023). On the other hand, Lizarelli et al. (2021) found that continuous improvement, regardless of method, positively related to both

incremental and radical innovation. Additionally, organizational leaders are trending away from closed to open innovations (Keinz et al., 2021). Keinz et al. (2021) identified open innovation strategies, such as crowdsourcing, ideation contests, and mobilizing resources as creative new ways to create value for the organization. Furthermore, innovation could create value for both products and processes.

Product Innovation. Product innovation involves creating value to customers through new or improved functionality of goods. Product innovation is a source of continuous improvement, which could increase organizational performance (Negulescu, 2020). Although some improvement suggestions come directly from customers, product innovators should analyze the functionality of products, during use, to develop improvement opportunities that customers may not have the capability of identifying themselves (Li et al., 2022). Ceptureanu and Ceptureanu (2023) advised that leaders who developed ambidexterity with explorative and exploitative innovation strategies simultaneously with decentralized decision-making could significantly improve product innovation performance. Thus, effective product innovation management is an aspect of continuous improvement that could create a competitive advantage.

Process Innovation. Process innovation includes improvement of the methods or operations of a business. Although some researchers argued that process innovation could negatively impact mental health due to job insecurity and stress (Du et al., 2023), tools for process innovation such as value stream mapping could reduce labor costs and improve quality (Mejri et al., 2021), potentially increasing sales (Rammer, 2023). Some strategies for leaders to employ to effectively implement process innovation could

include fostering an innovative culture for continuous improvement over time (Canbul & Çemberci, 2023), and avoiding too little process innovation when competition is intense or too much process innovation during highly uncertain times (Mooi et al., 2020). Furthermore, compared to developed countries, leaders in emerging countries might experience resource constraints and could consider searching for external knowledge from foreign partners (Aliasghar et al., 2022) and collaborating with suppliers (Chang-Muñoz et al., 2022). Nonetheless, ongoing innovative process management is necessary for continuous improvement.

Lean Implementation

Lean concepts include a realm of tools, methods, mindsets, and cultural change that aid in continuous improvement efforts. Researchers have found that lean implementation could help leaders increase cycle efficiency through value stream mapping (Jonny, 2021) and overall asset effectiveness through the DMAIC framework (Al-Akel & Marian, 2020). However, economic uncertainty could threaten the relationship between lean implementation and the satisfaction of customers and organizational goals (Basu et al., 2020). The tools and methods aid leaders in the technical aspects of applying lean, but external challenges could threaten the organization from maintaining a competitive edge.

Lean implementation involves a paradigm shift in organizational operations. Researchers have identified supplier-related quality issues and delays, poor equipment and technology, poor employee training and relations, and insufficient working conditions in factories as potential barriers to lean implementation due to lack of

employee trust and understanding (Ramdass et al., 2022). However, lean implementation could aid leaders in developing real-time information for improved decision-making (Larsson & Chandima Ratnayake, 2022). Furthermore, leaders could use lean implementation to facilitate collaborative problem-solving, which was shown to positively impact psychological safety and team learning among employees (Fenner et al., 2023). Lack of support from management, human resources, lean training, technology, the supply chain, and organizational cultural could pose risks to effective lean implementation that leaders should be aware of and mitigate (Machado Fagundes da Silva et al., 2021). Successful mitigation may consist of promoting innovation, education, and product quality (Todorović et al., 2022). Lean mindsets and culture are major contributing factors to successful lean implementation.

Leaders in only one out of four organizations who undertook lean implementation achieved expected improvement results (Maware & Parsley, 2022). Failure could occur due to regulatory environments, poor communication, or lack of resources (McDermott et al., 2022). On the other hand, multiple researchers have indicated that training is a critical success factor for lean implementation and sustainment (Chiarini & Brunetti, 2019; Williams, 2021). Other common themes in literature for lean implementation success include a cultural shift, engagement from leaders and employees (Maware & Parsley, 2022; Williams, 2021), and strategy (Chiarini & Brunetti, 2019; Laureani & Antony, 2018). These critical success factors in the literature have some level of implication for managers' role in lean implementation.

Effective lean management aids in successful lean implementation. However, research has shown that only 26% of companies in the United States that have incorporated lean management reach higher levels of lean efforts, while the figure is as low as 10% in the United Kingdom and Australia (Jing et al., 2020). Jing et al. (2020) stated that all levels of the organization must participate in making lean management successful, including top management initiating the strategy, middle management taking action and affecting change, and all levels with front-line employees operating through daily lean management. Employees engage when they are empowered and motivated by leaders, and leaders engage by actively talking with employees during regular Gemba walks (Williams, 2021) and developing lean operating routines (Knol et al., 2022). Furthermore, comprehensive standard work for leaders could increase the number of employee improvement ideas that get implemented (Mogaramedi et al., 2020). Leaders should not underestimate communication and recognition for employees in a lean organization, even when employees are motivated and engaged to participate (McDermott et al., 2023), and they could employ any of a number of different frameworks to deploy lean manufacturing.

TPS

Taiichi Ohno, former vice president of the Toyota Motor Company, developed TPS (Sugimori et al., 1977). Sugimori et al. (1977) explained that TPS is rooted in the Japanese culture to minimize production costs and add value to the product with fewer resources and advantages reaped by countries in Europe and the Americas. A conglomeration of lean practices makes up TPS. From a scheduling perspective, planning

inventory to arrive just in time for the manufacturing processes and leveling production for consistent usage of materials creates lower costs and increased efficiency (Inman & Bulfin, 1991). Continuous or one-piece flow, standardized work, Kanban, and visual management are additional value-added concepts of TPS in manufacturing (Kasul & Motwani, 1997). Kasul and Motwani (1997) stressed the value of TPS to benefit businesses' bottom line and increase profits.

Societal, cultural, and human relations are also critical components of TPS. The attitudes and behaviors of employees required for effective TPS include cooperation, problem-solving, and the ability to manage frustrations without an inflated self-image (Winfield, 1994). TPS is one of the early frameworks that addressed the value of people in the manufacturing industry by developing an understanding of employee motivations and workplace learning through the contribution of all employees (Jönsson & Schölin, 2014). Understanding TPS may equip middle managers with strategies to lower costs, increase productivity and efficiency, and create value in their processes and people, which are core lean manufacturing concepts.

TPS is a framework used in many industries to improve performance. Healthcare providers use TPS to increase the quality of patient care (Leming-Lee et al., 2019; Lu et al., 2022), service providers apply concepts of TPS for process efficiency to improve customer service (Smith et al., 2018), and manufacturers use TPS to increase quality and decrease the cost of products (Reke et al., 2022). In an age of instant gratification, business leaders and consumers alike have expectations of higher financial gains with

better and faster products and services (Roberts, 2014). TPS provides the means to remain competitive and successfully meet these changing needs.

TPS is a combination of lean tools and how they are applied. It was developed in Japan to overcome the disadvantage of resource constraints by making better quality products at lower costs and capitalize on the local culture of equality, diligence, and a desire to improve (Sugimori et al., 1977). Sugimori et al. (1977) outlined the primary tools of TPS, including just-in-time inventory management, Kanban withdraw systems, and single-piece continuous flow. These processes are tangible and potentially easy to replicate; therefore, the failure to replicate outcomes of effective TPS stretches beyond individuals' capabilities of using these tools. An analysis of TPS compared to Japanese Zen Buddhism exposed similarities of a particular mindset and philosophy that could contribute to the success of TPS in Asia that the western part of the world has struggled to mirror (Chiarini et al., 2018).

Alternate Continuous Improvement Approaches

Leaders could use any number of continuous improvement approaches to enhance performance incrementally. I have discussed lean implementation and the TPS. However, it is important to understand alternative continuous improvement approaches to identify commonalities and differentiation between them and lean implementation. In this final section of the literature review, I address common continuous improvement techniques, including six sigma, statistical process controls, TPM, and TQM.

Six Sigma. Some continuous improvement professionals employ statistical methods of continuous improvement, such as six sigma and the DMAIC framework. Six

sigma comprises design-oriented tools such as quality function deployment and failure modes and effects analysis, which could contribute to faster project completion time, and non-design-oriented tools such as pareto charts and design of experiments, which could contribute to lower project costs (Choo, 2022). Furthermore, cycle time and process capability improvements could result from applying six sigma (Ramadan et al., 2023). Despite the positive organizational impact that six sigma could allow leaders to generate, there are critical success and failure factors that they should consider.

Some leaders and practitioners experience difficulties effectively applying six sigma for continuous improvement. Dzulinski et al. (2023) found that over 70 tools could be applied in six sigma endeavors, resulting in an overwhelming number of activities that could take place. Dzulinski et al. (2023) proposed a sequential approach for applying specific tools during the initial, intermediate, then final stages of a project to ease this complexity and Fendi AlKubaisi et al. (2022) acknowledged that appropriate techniques may depend on unique organizational characteristics. Furthermore, Bhat et al. (2023) found that the highest failure factors of designing for six sigma included top management support, appropriately capturing the voice of customer, employee involvement, resource allocation, and measurement and analysis. Integrating six sigma with theory of constraints could mitigate weaknesses, with the potential of improved production costs by 1.56% to 3.55% (Ekleş & Türkmen, 2022). Six sigma is a complex approach to improve variability in processes and is not one-size-fits-all.

DMAIC is a framework within six sigma that could aid leaders in reducing process variability. For instance, da Silva Gomes et al. (2022) found that productivity was

improved and waste was minimized resulting in a 1.7% increase in company revenue. In another study, researchers found improvement of nonconformity from 23.940% to 0.049% (Gerger & Firuzan, 2021). However, many projects are at risk of failure in the analyze phase (Bhat et al., 2023). Yet, Pradhan et al. (2022) found that by calculating sigma metrics and conducting thorough root cause analysis, practitioners could overcome inaccuracies in the analyze phase. The goals and outcomes of six sigma application are consistent with many of the goals and outcomes of lean implementation with the inclusion of statistical process controls.

Statistical Process Controls. Data are used to track, view, and analyze facts in many applications. The most common types of charts used for statistical process controls include run charts of actual data points and statistical process control charts that include upper and lower control limits for process variability (Wolfe et al., 2021). These methods have proven successful in industrial and service sectors for improved quality assurance (Pérez-Benítez et al., 2023; Ueda et al., 2022). Although some leaders and practitioners may perceive statistical process control as a complex concept, automating data collection could ease the complexity and provide real-time information (Bottani et al., 2023). Since many processes have multiple quality characteristics, Vysakh et al. (2022) recommended using cause-and-effect diagrams to identify possible contributors and Hou (2023) proposed a test to detect outliers, when multiple variables exist, for out of control conditions. Statistics provide valuable information that leaders should combine with observations and knowledge at the Gemba to gain insight for continuous improvement.

TPM. TPM, sometimes referred to as total productive maintenance, is a tool in the lean manufacturing toolbox that leaders and practitioners could use to address wastes related to downtime and defects. Molefe and Pradhan (2021) used TPM to analyze the root cause of equipment failure downtime to eliminate and prevent recurrence, increasing overall equipment effectiveness. TPM could aid leaders in planning around a predictive maintenance schedule versus having to react to unexpected breakdowns (Saxena, 2022). Pinto et al. (2020) discovered that applying the TPM technique could lead to between 23% and 38% reduction in machine breakdowns and improved overall equipment effectiveness of 5%. These are examples of waste elimination for continuous improvement.

Whereas TPM most frequently has not addressed all types of manufacturing wastes, leaders and practitioners could use it in tandem with other lean concepts. Pairing TPM with other lean manufacturing tools could increase production availability by 39%, decrease mechanical obstructions by 42%, and increase production capacity by 26% (Barbieri-Silva et al., 2022). Jarufe-Majluf et al. (2022) provided another example of combining TPM with other lean tools to improve productivity and efficiency. These researchers suggested that a combination of tools with TPM had positive impacts on organizational performance.

There are mixed results on whether TPM has a direct relationship with organizational performance. Bashar et al. (2022) found a direct, positive correlation between TPM and organizational performance along with TPM as a mediating factor between employee involvement and organizational performance, with 72% of variance in

organizational performance attributed to the combination of employee involvement and TPM. On the other hand, Khalfallah and Lakhal (2021) argued that a direct link between TPM along with other lean tools and operational performance did not exist unless mediated by agile manufacturing. In one study, the most critical success factors to implementing TPM included top management support, employee training, and a lean culture grounded in flow, ownership, and involvement (Singh & Gurtu, 2022). As such, addressing the implementation of lean tools, including TPM, requires leaders' support and an engaged workforce.

TQM. TQM is another method within the continuous improvement framework, geared toward the internal processes of an organization and the cost of quality. Leaders could use TQM to enhance their competitive advantage with a positive correlation to the balanced scorecard and improving learning through employee involvement (Ahmad et al., 2022). Similar to six sigma and statistical process controls, TQM requires data-driven decision-making where leaders could use digital technologies to ease data collection and analysis (Clancy et al., 2023). Researchers who studied a correlation between measuring cost of quality and results found that in organizations where leaders effectively measured cost of quality, a lower cost of quality was achieved (Bris et al., 2022). Defining, measuring, and analyzing key performance indicators of TQM, as with other continuous improvement methods, aid leaders in making appropriate improvements and sustainment.

TQM includes a broad range of applications and requirements for success. Although TQM is used in manufacturing and service industries (Wall, 2021), it is more prevalent among manufacturing companies, and Bouranta (2021) found a common theme

among organizations in both categories that transformational leadership positively impacted TQM implementation. Furthermore, García-Alcaraz et al. (2021) found that leader commitment was the most critical success factor for TQM . However, the specific type of organizational culture, including group, developmental, rational, and hierarchical, had less significance since all were positively correlated with TQM (Dimitrantzou et al., 2022). Other critical success factors for TQM included customer satisfaction, employee involvement, training and education, continuous improvement, employee encouragement, and service quality (Wassan et al., 2023). Like other continuous improvement methods, TQM could fail without the proper support and engagement.

There are many benefits related to TQM implementation. Leaders have used TQM to improve occupational health and safety (Aichouni et al., 2023), market orientation (Bhaskar, 2020), quality performance (ElMelegy et al., 2022), employee performance (Udofia et al., 2021), and organizational productivity (Maddala et al., 2023). However, through simulation analysis, Faisal and Karthigeyan (2022) found that lean manufacturing was superior to TQM for increasing throughput by eliminating waste. Therefore, this study was aimed at the broader realm of lean manufacturing, including waste elimination and improved processes for overall business performance.

Transition

In Section 1, I identified a gap in business literature related to middle managers' motivation to implement lean in manufacturing. As such, I stated the problem, purpose, intended population and sampling method, and nature of this study. Grounded in the SDT, I aim to answer the question: What is the relationship between middle managers'

competence, relatedness, autonomy, and level of lean implementation? I have listed operational definitions and specified assumptions, limitations, delimitations, and the significance of this study. Section 1 is concluded with an exhaustive review of the related professional and academic literature.

In Section 2, I will restate the purpose of this study and define my role as the researcher, participant selection, research methods and design, the population and sampling method, and ethical research. Furthermore, I will provide detail for the data collection instruments I will use, along with data collection technique, data organization technique, data analysis, and the validity of this study. In Section 3, I will present the findings and state the applications to professional practice, implications for social change, recommendations for action, and recommendations for further research.

Section 2: The Project

I begin Section 2 with a restatement of the purpose for this study, which is followed by an explanation of the expectations and procedures for my role as the researcher. To address the methodology used in this study, I describe the participant selection process, research methods and design, and the population and sampling methods. I then present the considerations for conducting ethical research and conclude the section with a discussion of the data collection instruments, techniques, organization, and analysis as well as the study's validity.

Purpose Statement

The purpose of this quantitative correlational study was to examine the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation. The independent variables were competence, relatedness, and autonomy, and the dependent variable was level of lean implementation. The study population included middle managers of manufacturing operations in the midwestern United States. The implications for positive social change include strengthening the abilities and engagement of human capital, sustaining manufacturing facilities to continue providing jobs, and fostering the concept of working smarter versus harder so that employees could realize a satisfying work-life balance.

Role of the Researcher

My role as the researcher in this quantitative study involved administering surveys to collect data and analyzing it. Although the *p* value is important in determining statistical significance in quantitative research, the researcher should avoid

overemphasizing the importance of reaching statistical significance to ensure accurate and ethical reporting (Lynch et al., 2020). In addition to preventing mining for statistically significant *p* values, Palanski et al. (2021) noted the importance of hypothesizing before data collection and the limitation of quantitative research not reflecting reality. I mitigated these risks by preparing and detailing my research methods and design before beginning data collection.

The researcher must also consider social responsibility throughout the study. Zivony et al. (2023) recommended the following steps for socially responsible research: (a) seek diverse perspectives early, (b) recognize limitations, (c) consider social theory and include historical context when reporting findings, (d) state hypotheses and data collection and analysis methods ahead of the study and stick to them, (e) maintain a balance between oversimplified or overstated results, (f) remain sensitive to selected terminology, (g) seek an unbiased and rigorous review, (h) take care in considering how individuals could misinterpret results, (i) thoughtfully and respectfully respond to critique, and (j) humbly retract or submit corrections if flaws are detected after publication. I took these steps into consideration throughout the entirety of the current study.

My role as the researcher involved the awareness and avoidance of bias throughout the process. Researcher bias could occur when a researcher allows their personal views or experiences to influence data collection and analysis, negatively impacting the reliability of their study (Saunders et al., 2016). Although I have extensive professional experience in lean manufacturing in the Midwest, I strived to remain

unbiased and analyzed the data objectively to answer the research question in this study specifically. Participant bias could occur if participants are untruthful in their responses for any reason (Saunders et al., 2016). Since I administered a survey through an online platform, participants could take the survey in the privacy of their home or office, and their responses were not attached to their name or any other identifier, which minimized the chance that they might feel influenced to respond in a particular way.

The researcher is responsible for upholding the highest level of ethical standards. In the *Belmont Report*, The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (1979) enacted guidelines regarding the ethical research of human subjects to include respect, beneficence, and justice through informed consent, risk and benefit assessment, and fair methods of participant selection. Anabo et al. (2019) addressed potential challenges of adhering to the *Belmont Report* standards while conducting internet-mediated research. As such, I followed their recommendation through seeking informed consent by requiring a checkbox acknowledgement of participants' understanding of the anonymous, autonomous, and voluntary nature of their participation before taking the online survey. Furthermore, participants could withdraw from the survey anytime by exiting without completing and submitting their responses. Since I solicited participation through a third-party online survey platform, I did not have direct contact with participants.

Participants

Appropriate participant selection was critical to answering the overarching research question. Participants for this study included middle managers in manufacturing

organizations in the midwestern United States. Middle managers are individuals who directly oversee production operations and the labor force and include plant managers, production managers, quality managers, continuous improvement managers, and any other production-related individual with “manager” in their current title. Manufacturing organizations in the midwestern United States consist of factories that produce consumer goods in Illinois, Ohio, Michigan, Minnesota, Wisconsin, Indiana, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota. To participate in this study, individuals must have lived and worked in one of the states listed at the time of their participation in this study.

I primarily used networking to gain access to participants. I began by posting information of the study and a link to the survey on my LinkedIn profile page. I also used LinkedIn to search for individuals who met the eligibility requirements of this study and personally sent them information about the research and requesting their participation. Using social network platforms to gain access to participants can allow researchers to reach a broad population but also poses the risk of publicly spread negative commentary (Waling et al., 2022). Although online surveys allow the convenience of self-selection, some professionals are difficult to engage due to their interpretation of researcher credibility based on language used, resonance of the invitation requesting their participation, and time constraints (Hopkins & Schwanen, 2022). I monitored comment feeds on the posting related to this study and remained sensitive to interpretations and time constraints to mitigate these risks.

In this quantitative study, I did not form a working relationship with my participants; however, I remained professional and pragmatic about my communication and intentions with this research. Whereas, using graphical depictions within communication, such as emoticons, could have a positive persuasive impact among individuals with close relationships, this persuasive impact did not exist for individuals with distant relationships unless the communication had negative connotation (Qiu et al., 2023). Maintaining a distant relationship with participants should have minimized concerns of anonymity and researcher bias.

Research Method and Design

Researchers must determine whether they will use qualitative, quantitative, or mixed methods and the subsequent design for their study. In this study, I examined a relationship between variables; therefore, the quantitative research method and correlational design were employed.

Research Method

Research methods are influenced by the researcher's world views. For instance, researchers with ontological views of objectivity and one true reality generally lean toward quantitative research versus their counterparts who believe in complex realities with rich constructs who would more likely use qualitative research (Saunders et al., 2016). More simply, Saunders et al. (2016) used numeric versus nonnumeric qualities of research to differentiate between quantitative and qualitative, respectively. Bougie and Sekaran (2020) provided data collection examples of these methods, including numerical answers to questions in quantitative research and open-ended answers or broad

observations in qualitative research. Since I used a questionnaire to collect numeric data to satisfy my quest for objectivity, the quantitative research method was more appropriate for this study than the qualitative research method.

Mixed-methods research is another approach that some researchers use to answer their research question. Mixed-methods data collection could involve the collection of both qualitative and quantitative data or all qualitative data collection where some of the qualitative data are converted to quantitative data for analysis (Schoonenboom, 2023). Sakata (2023) described mixed methods as "messy" due to complexities, such as ensuring qualitative data underwent qualitative analysis and quantitative data underwent quantitative analysis or discovering that findings from qualitative and quantitative data sets within the same study had divergent results. I did not collect any qualitative data and chose to avoid the complexities that combining qualitative and quantitative methods could create. Therefore, the mixed-methods approach was not appropriate for this study.

One of the hallmarks of quantitative research is its deep-seated attachment to theory. Whether old, long-established theories or contemporary, conceptual theories, a researcher's engagement with theory is necessary in using data to address quantitative research questions (Franklin, 2023). Furthermore, data analysis within quantitative research may expose different patterns, but the results will always related back to existing variables related to a tested theory (Schoonenboom, 2023). These traits of quantitative research were suitable for my study because I collected data to objectively assess a relationship between variables of an existing motivational theory and the level of lean implementation of middle managers in manufacturing.

Research Design

The research design is the blueprint for how the data are collected, analyzed, and synthesized, which must align with the research method, purpose, and overarching question (Saunders et al., 2016). In quantitative research, researchers can choose to use experimental or nonexperimental designs, and the main differentiator between these options is that in experimental designs the researcher introduces an intervention to study the direct effects of the intervention on the participants (Novosel, 2022). Novosel (2022) noted that there is a connection between cause and effect when conducting experimental research. Therefore, this study was nonexperimental because I did not introduce any interventions and was not seeking a causal relationship.

Researchers could conduct nonexperimental studies to describe or examine phenomena. Descriptive research designs are often conducted in real-life settings, through observations over time (Bloomfield & Fisher, 2019) to generate a profile of a population in a particular setting (Saunders et al., 2016). On the other hand, Bloomfield and Fischer (2019) identified the correlational design as a way to examine the degree, strength, and type of relationship between variables using correlational statistics. In contrast to descriptive research, correlational research does not require access to participants for observations or are descriptive statistics of participants directly related to the research question in this study. Therefore, the descriptive research design was not appropriate for this study.

I used the correlational design to answer the research question regarding a relationship between competence, relatedness, autonomy, and level of lean

implementation among middle managers in manufacturing. Green and Salkind (2017) provided guidance on statistical analysis for correlational studies, including using the Pearson product-moment correlation coefficient to determine the degree of linear relation between variables and partial correlations to determine effect size. Since there was more than one independent variable in the research question, I employed multiple linear regression to analyze data in this correlational study. My aim was to assess if a linear relationship existed between competence, relatedness, autonomy, and level of lean implementation and to what degree and strength.

Population and Sampling

The overarching research question in this study was geared toward middle managers' competence, relatedness, autonomy, and level of lean implementation. Therefore, the population in this study comprised middle managers with some level of exposure to, or knowledge of, lean concepts. The population consisted of individuals with titles including, but not limited to, plant manager, production manager, continuous improvement manager, and quality manager. Geographically, the sample came from a population of middle managers who worked in manufacturing organizations and lived in the midwestern United States, including the states of Illinois, Ohio, Michigan, Minnesota, Wisconsin, Indiana, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota.

Researchers determine whether to use a probabilistic (i.e., random) or nonprobabilistic (i.e., nonrandom) sample of the population in their research design. Furthermore, the research design may not create a clear path toward this decision. For instance, Lesik (2006) found that, although random sampling is most common for

experimental designs, random and nonrandom sampling methods could lead the researcher to make causal inferences in experimental research. Researchers may also use random or nonrandom samples when collecting survey responses for quantitative studies. In these cases, nonrandom sampling is more common since gaining a true random sample is difficult and often unnecessary, particularly when attempting to answer a question about theory versus generalize about a population (Spelklé & Widener, 2018). Since I did not intend to generalize about a population but rather determine the relationship between variables related to the SDT, I chose to use nonrandom sampling.

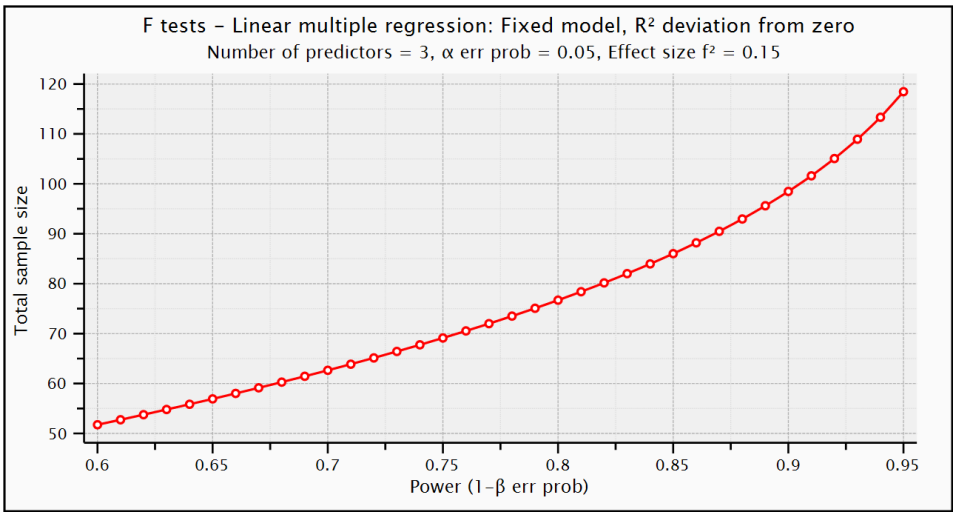
Researchers could conduct nonrandom sampling using various techniques, including convenience, purposive, quota, and snowballing. Convenience sampling may consist of online solicitation through a social media outlet (Alexandrova, 2022). Alexandrova (2022) noted the time, money, and effort that researchers could save with convenience sampling but also identified risks, such as representativeness and accessibility of respondents. With purposive sampling, the researcher is deliberate to ensure the sample is appropriately matched with the aim of the research question, increasing the trustworthiness of data and the results (Campbell et al., 2020). Quota sampling involves sample subcategories from which the data are collected. For instance, Futri et al. (2022) identified quota sampling as the most appropriate technique for household research whether in-person or online. The snowballing method of nonrandom sampling is useful when lists of eligible participants are difficult to obtain due to vulnerability and unknown breadth of the population (Voicu & Babonea, 2011). Since I

sought participants that fit the purpose of this research study, the primary, nonrandom sampling method I used was the purposive method.

Determining an appropriate sample size is another critical component of the population and sampling design for a research study. Factors that a researcher should consider when selecting sample size include the level of confidence they would like to have in their data, the amount of error they will allow, the number of variables undergoing testing, and the size of the target population (Saunders et al., 2016). Bougie and Sekaran (2020) also included the population variability and cost or time constraints as factors when considering the sample size of a study. Using the G*Power Version 3.1.9.7 software, I input parameters including a medium effect size ($f^2 = 0.15$), a standard alpha value ($\alpha = 0.05$), and three predictor variables. Figure 1 depicts the graphical representation of the sample size required to achieve various levels of statistical power. To achieve a statistical power of 0.80, I needed a minimum of 77 usable responses in the sample.

Figure 1

*G*Power as a Function of Sample Size*



Ethical Research

There are many aspects to conducting ethical research, and it is the researcher's responsibility to ensure their practices meet all ethical standards. One aspect is adherence to informed consent, which involves informing prospective participants that their participation in the study is confidential, voluntary, and includes their right to protection of privacy (Bougie & Sekaran, 2020). Some researchers believe that informed consent through online-mediated surveys is as simple as using an electronic checkbox (Saunders et al., 2016). However, with the growing prevalence of online research, other researchers have identified the importance of alignment between required understanding, actual understanding, and factual control over authorizing truly informed consent (Burkhardt et al., 2023). An example of this disconnect was highlighted in a study conducted by Mondal et al. (2023) who found that only 41% of online surveys included informed

consent where the participant had to check a box, and even then, the consent only contained an average of 4 out of 13 required elements.

To ensure informed consent that consists of actual participant understanding that matches their required understanding to have factual control over their authorization of consent, I included all required elements of informed consent and required participants to check a box on the online survey verifying their authorization. Participants could withdraw from the study at any time by exiting the survey before submitting their responses. There were no incentives, financial or otherwise, that I offered to participants in this study. I did not ask for participants' names or other identifiable information that could tie individuals to their responses or participation in this study. I stored data on a device that is password protected where I have sole access to the data, and I will securely store the data for 5 years to protect confidentiality. The Walden University's IRB approval number for this study is 12-01-23-1161249 and expires on November 30, 2024.

Data Collection Instruments

The instrument I selected to collect data for this study was the Basic Psychological Need Satisfaction at Work Scale (BPNS-W). Among the developers of the BPNS-W (Deci et al., 2001; Ilardi et al., 1993; Kasser et al., 1992) were the authors of the SDT, Ryan and Deci, as they sought to measure the three intrinsic needs of people at work: competence, relatedness, and autonomy. The Center for Self-Determination Theory website allows users access to validated surveys, provided they agree to terms and conditions and that the survey is not used for commercial purposes (Center for Self-

Determination Theory, 2023). Therefore, no additional request to gain access to this survey was necessary.

The BPNS-W scale was the most appropriate for this study due to its overall fit with the research question and, subsequently, its reliability and construct validity. The website for The Center for Self-Determination Theory (2022) contains many available surveys and questionnaires related specifically to the SDT. However, since early developments of the SDT revolved around simply extrinsic versus intrinsic motivation (Gagné & Deci, 2005), many questionnaires were developed to address this broader level of motivation and were not suited to aid me in assessing the specific variables within intrinsic motivation. Since I am focused on the workplace, I evaluated the Work Climate Questionnaire as a plausible option. However, the Work Climate Questionnaire is heavily focused on autonomy, as Baard et al. (2004) noted autonomy as a causal regulator of intrinsic motivation. Nevertheless, Baard et al. (2004) found that intrinsic need satisfaction related to autonomy, relatedness, and competence was positively correlated with work performance, supporting construct validity for the BPNS-W. The BPNS-W contains questions specific to each of the three types of intrinsic motivation that I was addressing in this study, and the questions are worded to relate to individuals in a work setting; therefore, it was fitting to address my research question.

The BPNS-W is a 21-item questionnaire, separated by six items for competence, eight items for relatedness, and seven items for autonomy, with response options on a 7-point Likert scale ranging from 1 (*not at all true*) to 7 (*very true*). Although some researchers have debated whether Likert scales are ordinal or interval in nature (Bougie

& Sekaran, 2020), I will treat it as an interval scale in this study with the intent of gathering mean and standard deviation information. Within each category, three questions are reverse coded, which Bougie and Sekaran (2020) noted is a strategy researchers could use to detect carelessness or participant bias in questionnaire responses. I averaged the scores of the questions within competence, relatedness, and autonomy, using the reverse scores for the questions that were reverse coded, to obtain an aggregate score for each construct.

Reliability testing of this instrument was conducted with Bulgarian and American sample populations. Deci et al. (2001) found that Cronbach's alpha for total need-satisfaction in both countries exceeded .80. Through confirmatory factor analysis and structural equation modeling, Deci et al. also determined that the constructs were equivalent across countries. In the U.S. sample, Cronbach's alpha for total need satisfaction was .89, and the results for the competence, relatedness, and autonomy subscales were .73, .84, and .79, respectively.

The full questionnaire that I used in this study included demographic questions, screening questions, and one self-written question to address my dependent variable. Hughes et al. (2022) recommended including questions regarding age, gender, race, and social class in all research studies regardless of the topic and tailoring additional questions to the research aim, being mindful of length and burden on the participant. Hughes et al. also emphasized the importance of careful consideration when selecting the language they use for demographic questions to ensure inclusivity. The screening questions enabled me to ensure that participants met eligibility criteria, including middle

management positions and Midwest locations. Solke and Singh (2018) studied the level of lean in manufacturing from several dimensions, including waste elimination, continuous improvement, zero defects, just-in-time, pull versus push, multifunctional teams, decentralization, integration of functions, and vertical information systems. I used this study as a guide to develop one question that addressed my dependent variable, the level of lean implementation, using a 7-point interval Likert scale ranging from 1 (*very low*) to 7 (*very high*). The full questionnaire for my study contained a total of 29 questions and I administered it through the online platform, SurveyMonkey. A copy of the full questionnaire is located in the Appendix.

Data Collection Technique

As online surveys have become more popular in the post-COVID era, researchers have learned what works well and what new challenges exist. One of those challenges is survey fatigue. Since online surveys are easier, cheaper, and faster means of reaching respondents, some individuals are becoming overburdened with survey participation requests (Maslovskaya et al., 2022). However, with the proper knowledge, capabilities, and tools, while ensuring proper safety protocols, including data encryption and confidentiality, online surveys allow researchers to collect large amounts of data more efficiently, conveniently, and cost-effectively (Odutayo, 2023). Therefore, my goal was to use this popular, modernized technique, while keeping participants in mind to avoid making anything in the process lengthy or difficult for them.

I prepared for data collection by inviting participants to take part in this study primarily through social media and email invitations. I used LinkedIn as the primary

social media outlet for soliciting participation. I posted a brief description of the purpose of the study, inclusion criteria, and a link to the survey to my personal LinkedIn page as well as relevant professional networking groups. I included a statement on the post inviting individuals to repost and share the invitation with other professionals within their network who might be interested in participating. The link directed the participants to the survey through SurveyMonkey, where they were directed to the consent form, indicated whether they agreed to continue to proceed, and began the survey with demographic and screening questions. If the participant did not click "I Consent" or did not meet inclusion criteria during the screening questions, the survey ended, and they were not directed to the remaining portion of the questionnaire. I continued to reach out to new individuals and new networks of people within my targeted audience and continued collecting data until I reached the minimum number of 77 responses for this study.

I collected data through the online survey platform, SurveyMonkey. Some researchers have voiced concern with sampling bias in online surveys where a sampling platform could have more individuals of a specific demographic compared to others (Newman et al., 2021). Since I reached out to a broad range of potential participants through social media and professional networking outlets, I reduced the risk of having sampling bias in my online research. Overall, from reviewing literature and conducting their own research, Nugraha and Susilastuti (2021) found that data quality of online research was similar to traditional research. Therefore, I was comfortable with using the online survey data collection technique. Also, due to the existing data regarding the

reliability and validity of the instrument, I did not conduct a pilot study prior to full data collection.

Data Analysis

The research question I aimed to address was: What is the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation? The null hypothesis for my study was: There is no significant relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation. The alternative hypothesis for my study was: There is a significant relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation.

Researchers must select appropriate means of data analysis that fit the purpose, method, and design of their study. For instance, qualitative researchers use strategies such as thematic, narrative, discourse, or content analysis (Saunders et al., 2016). Since I did not conduct a qualitative study, these were not appropriate data analysis methods for my study. The appropriate alternative for quantitative researchers is to conduct statistical analysis.

At the beginning of this survey, there were demographic questions regarding age, gender, race/ethnicity, length of employment in manufacturing, and length of employment in the participants' current position. I used these questions to formulate descriptive statistics that enabled me to summarize the demographics of my study participants. Although descriptive statistics do not allow a researcher to make claims about hypotheses, they are an important part of data collection and analysis that could aid the researcher in observing comparisons between variables (Pakgohar & Mahrannia,

2023). These statistics complemented the inferential statistics throughout the rest of my data analysis.

There are several types of statistical analysis. When researchers aim to evaluate the difference between two independent groups or two conditions of an independent group, they would conduct an independent samples or paired samples *t*-test (Green & Salkind, 2017). I was not seeking to find the difference between two independent samples or paired samples of an independent group in my study; therefore, I did not conduct a *t*-test. An analysis of variance (ANOVA) and analysis of covariance (ANCOVA) are used when researchers would like to test the effects of variables either between or within groups of study participants (Green & Salkind, 2017). This type of data analysis also did not fit the aim of my study, as I was not testing the effects of variables between or within groups of study participants. Alternatively, regression analysis allows the researcher to assess the relationship between one or more independent variables and a dependent variable through simple or multiple regression analysis (Bougie & Sekaran, 2020). The statistical analysis I used for this quantitative correlational study was multiple regression analysis since I addressed a relationship between multiple independent variables and a single dependent variable.

Data Screening and Cleaning

Before analyzing data, it is important to screen data for cleanliness. During screening, the researcher should look for missing data and patterns that may seem out of the ordinary (Ritter & Sue, 2007). Bougie and Sekaran (2020) noted that missing responses were generally acceptable if minimal (e.g., less than 25% of questions left

blank). I set rules through SurveyMonkey that if a question was left blank, the participant would be alerted that there was a missing response. Participants would have the option to return to the question to complete their responses or exit the survey, withdrawing their participation from the study. This strategy eliminated the possibility of having completed surveys with missing data, which is required for multiple regression. I will address how I screened for unusual data when testing for assumptions in the next sections.

Multiple Regression Assumptions

Statistical analysis involves making assumptions about the data to conduct tests and interpret results to determine significance. There are eight assumptions that multiple regression analysis must meet: (a) one dependent variable measured on an interval or ratio scale; (b) two or more independent variables measured on continuous or nominal scales; (c) independence of observations; (d) linear relationships between the dependent variable and the independent variables individually and collectively; (e) homoscedasticity of residuals among data; (f) data are void of multicollinearity; (g) unusual data points are not in the dataset; and (h) residuals are approximately normally distributed (Laerd Statistics, 2013a). I will expand on what each of these assumptions mean and how I validated them in the following paragraphs.

The dependent variable in this study was the level of lean implementation and was measured on an interval, Likert scale. Since there was one dependent variable and it was measured on an interval scale, the first assumption for multiple regression analysis was met. There were three independent variables in this study: competence, relatedness, and autonomy. These independent variables were measured on interval, Likert scales as

well. Interval, or Likert scales, are continuous versus categorical in nature. Therefore, the criteria of the second assumption for having two or more independent variables measured on continuous or nominal scales was met for this study.

The third assumption was that all cases in the study had independence of observations. In other words, no correlation should exist between participants' responses (datasets) from the survey. I tested for independence of observations using Statistical Package for the Social Sciences (SPSS) Statistics by running a Model Summary evaluating the Durbin-Watson statistic. If the Durbin-Watson statistic is approximately 2, a researcher can assume independence of observations (Laerd Statistics, 2013e). Since the Durbin-Watson statistic was closer to this midpoint of 0-4 than either end, I accepted this assumption. Had the Durbin-Watson statistic been closer to 0 or 4, I would have considered an alternative type of data analysis.

The fourth assumption is that linear relationships collectively exist between the independent variables and the dependent variable and that relationships exist between each independent variable and the dependent variable. A scatterplot test allows the researcher to determine the linearity of the collective independent variables and the dependent variable, and a partial regression plot allows the researcher to determine the linearity of each independent variable and the dependent variable (Laerd Statistics, 2013h). I ran the scatterplot test in SPSS Statistics to determine if the residuals formed a horizontal band, allowing me to assume that the collective independent variables had a linear relationship with the dependent variable. Next, I ran partial regression plots in SPSS Statistics to determine if the residuals had a linear path, allowing me to assume that

the independent variables each form a linear relationship with the dependent variable. If any of the linearity assumptions were violated in these tests, I would have attempted to transform the data using the Box-Cox method (Box & Cox, 1964), then rerun the scatterplot test and the Durbin-Watson test to confirm the third and fourth assumptions were still met after data transformation. If I could not confirm the assumptions or appropriately transform the data to meet the assumptions, I would have considered an alternative type of data analysis.

The fifth assumption was homoscedasticity or equality of variances. Researchers can use the same scatterplot used to test for the linear relationship when testing for homoscedasticity (Laerd Statistics, 2013g). Leard Statistics (2013g) advised that the residuals on the scatterplot should exhibit no pattern, including funnel or fan shaped dispersion of data points; therefore, I used the same scatterplot as the linearity test to observe for the existence of any patterns. If I had violated the assumption for equality of variances, I would have transformed the data through square root or logarithmic transformation and rerun the scatterplot test. If the data transformation did not allow me to achieve homoscedasticity, I would have considered an alternative type of data analysis.

The sixth assumption was that multicollinearity did not exist. Multicollinearity exists when there is a high degree of correlation between two or more of the independent variables. Researchers could have issues interpreting results if independent variables were correlated in multiple regression analysis since, as Singh et al. (2023) simply noted, independent variables must be independent. There are two steps to testing for multicollinearity using SPSS Statistics (Laerd Statistics, 2013b). First, I ran a linear

regression correlation test. I assessed that the independent variables had correlation coefficients less than 0.7 to ensure that the first test that multicollinearity did not exist passed. Second, I ran a tolerance and VIF test. With tolerance values greater than 0.1 (thus, the VIF is less than 10), I confirmed that multicollinearity did not exist. If multicollinearity existed in my dataset, I would have dropped off one of the variables that violated the assumption (beginning with the offending variable that has the higher VIF value as recommended by Singh et al.) and rerun the tests for assumptions.

The seventh assumption was that there were no unusual data points in the dataset. There are three types of unusual data points a researcher should test for: outliers, high leverage points, and highly influential points (Laerd Statistics, 2013d). Using SPSS Statistics, I tested for outliers using a Casewise Diagnostics table and looked for any case where standardized residuals were greater than +/- 3 standard deviations from the mean. If I had found any outliers, I would have removed them from the dataset. Next, I tested for high leverage points. If the data in all cases had leverage values of less than 0.2, I considered the data safe to use. If any of the leverage values were higher than 0.5, I would have removed them from the dataset. If the leverage values were between 0.2 and 0.5, I would have made note of the dataset and determined if they also led to high influence before determining if I would remove them from the dataset as well. Finally, I tested for influential points by investigating if any Cook's Distance values exceeded 1. If I had found any highly influential values, I would have removed them from the dataset. Once I validated the assumption of no unusual data points, I ensured I still had the minimum number of required datasets since I did not need to remove any. If I had

removed datasets and was left with fewer than 77, I would have continued to collect data until I had met the minimum number of datasets and rerun tests for assumptions.

The eighth assumption was that residuals were approximately normally distributed. SPSS Statistics allows a researcher to generate a histogram with a superimposed distribution curve (Laerd Statistics, 2013c). I tested this assumption by looking for a mean of approximately 0 and a standard deviation of approximately 1 on the histogram that I generated. I verified the results by looking at the P-P Plot to ensure the residuals are aligned along a diagonal line to confirm my assessment for normality. If my residuals were not approximately normally distributed, I would have transformed the data using square root, logarithmic, or inverse transformation depending on the strength and position of skew and rerun the test for normality.

Interpreting Results

The final stage of my statistical analysis was interpreting the results. The first step of interpreting the results was to report the goodness of fit for the model by finding the multiple correlation coefficient, R, the proportion of variance in the dependent variable explained by the independent variables, R^2, and the statistical significance of the data (Laerd Statistics, 2013i). Next, I interpreted the beta coefficients, which allowed me to assess whether each continuous independent variable has a positive or negative correlation with the dependent variable and to what degree (Laerd Statistics, 2013f). I used the statistical significance of $p < 0.05$ to determine with 95% confidence whether a positive or negative correlation existed. I used IBM SPSS Statistics Version 28.0.1.0 for

data analysis and referred to Laerd Statistics as a guiding tool throughout my data collection, analysis, and reporting findings.

The multiple correlation coefficient, R, could range from 0 to 1. The closer R is to 1, the stronger the linear association is between the dependent and independent variables, whereas the researcher would find no linear association if R is 0. The R^2 value aids a researcher in determining the amount of variation in a dependent variable is explained by the independent variables, while the significance determines the likelihood the results occurred by chance alone (Saunders et al., 2016). According to Cohen (1988), an R^2 value equal to or greater than 0.26 represents a strong effect size. This means that the independent variables have explained at least 26% of the variability in the dependent variable. To determine if my results were statistically significant using the multiple regression model, I evaluated the significance (p) value. If $p < .05$, the researcher may interpret the results as statistically significant (Green & Salkind, 2017). If R were near 1, $R^2 > 0.26$, and $p < .05$ for the multiple regression model summary, I could assume the model was a good fit and that correlations exist between independent variables and the dependent variable. With smaller R and R^2 values, I noted the smaller effect size and addressed the impact in Section 3.

The Beta coefficient, β, is interpreted differently for continuous independent variables than categorical variables. Since all the independent variables in this study were continuous, the interpretation of results for Beta coefficients in this section was specific to continuous independent variables only. The β value could range from -1 to 1, where a negative value indicates a negative slope or correlation, and a positive value indicates a

positive slope or correlation. Furthermore, the values of β for competence, relatedness, and autonomy indicated the amount of change in the level of lean manufacturing (the dependent variable) influenced by a one-unit change in each of these independent variables. Using SPSS Statistics, a 95% confidence interval for β that ranges from a lower bound negative number to a higher bound positive number would yield a nonsignificant result, where $p > 0.05$ (Laerd Statistics, 2013f). Therefore, to have 95% confidence that my results are statistically significant, I looked for $p < 0.05$ and a lower and upper bound number that are either both negative or positive.

Study Validity

It was my academic, professional, and ethical duty to ensure the results and reporting in this study were valid. Saunders et al. (2016) grouped several types of validity into three categories. Validity that demonstrated the appropriateness of the measurements used, validity that demonstrated the accuracy of data analysis, and validity that demonstrated generalizability of findings. To focus on each of these topics, I will discuss how I addressed construct validity, statistical conclusion validity, and external validity in the current study.

Construct Validity

In this study, I explored the relationship between middle managers' (a) competence, (b) relatedness, and (c) autonomy, and the level of lean implementation in manufacturing. The instrument I used in this study was the BPNS-W. The BPNS-W contains questions specific to competence, relatedness, and autonomy (Deci et al., 2001; Ilardi et al., 1993; Kasser et al., 1992). Furthermore, Baard et al. (2004) found that

intrinsic need satisfaction related to these three constructs was positively related to work performance. Construct validity refers to how well the measurement fits the theory the researcher is testing (Bougie & Sekaran, 2020). I have appropriately addressed construct validity in my study by choosing a tested, reliable, and valid instrument that fit the constructs of the theory I tested.

Statistical Conclusion Validity

Researchers could make two types of errors upon concluding a research study: rejecting a null hypothesis that is true, or failing to reject a null hypothesis when the alternative hypothesis is true (Bougie & Sekaran, 2020). Bougie and Sekaran (2020) noted that more importance is placed on the first (a Type I error) in business research than the latter. The main threat to conclusion validity would involve the researcher stating that a relationship exists between variables that were not inherently present (Saunders et al., 2016). Thus, the statistical conclusion validity of this study depended on my accurate testing of assumptions and ensuring that I only rejected the null hypothesis if the significance (*p* value) was less than 0.05, indicating that the results did not occur by chance alone.

External Validity

Some researchers or decision-makers, such as in business and politics, could take an interest in understanding if study findings are applicable to other individuals or groups outside of the study participants. External validity is the extent to which results could be generalized to a broader population or other settings (Saunders et al., 2016). Trafimow (2023) identified an ever-present assumption of random selection from the study

population to claim external validity for generalizability with inferential statistics. By recruiting participants in open social media and networking platforms, I reduced selection bias. Reducing selection bias from the population aided me in achieving external validity.

Transition and Summary

In Section 2, I restated the purpose of this study and described my role as the researcher. Additionally, I described the participants, outlined my research method and design, and described the population and sampling for this study. Furthermore, I discussed ethical research, and identified the data collection instrument, technique, and analysis I used in this study, identifying how I strived for conclusion and external validity. In Section 3, I will present my findings, state the application of findings to professional practices, identifying implications for social change, and make recommendations for future action and further research.

Section 3: Application to Professional Practice and Implications for Change

The purpose of this quantitative correlational study was to examine the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation. The independent variables were middle managers' competence, relatedness, and autonomy, and the dependent variable was the level of lean implementation. The model was able to significantly predict level of lean implementation, $F(3, 73) = 4.521$, $p < .01$. The R^2 value of .157 is evidence that 15.7% of the change in level of lean implementation is predicted by competence, relatedness, and autonomy. Independently, relatedness had a statistically significant positive relationship with the level of lean implementation ($p < .05$).

Presentation of the Findings

The research question I aimed to address was: What is the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation? The null hypothesis was that there is no significant relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation. The alternative hypothesis was that there is a significant relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation.

The study population consisted of middle managers in manufacturing in the midwestern United States. Middle managers included positions, such as plant managers, production managers, quality managers, and continuous improvement managers. Positions, such as executives, front-line leaders, and shop floor operators, were excluded from the study. Manufacturing organizations in the midwestern United States consisted of

factories that produce consumer goods in Illinois, Ohio, Michigan, Minnesota, Wisconsin, Indiana, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota. There were 102 participants who initiated taking part in the survey; however, the final sample size was 77 due to 25 data sets that were incomplete due to participants either opting out at some point of the survey or not meeting initial screening question criteria.

Descriptive Statistics

Demographic frequencies are provided in Table 2. The age range of participants included only 1.3% of participants (n = 1) below the age of 24 years old and above 65 years old, with the majority (59.8%; n = 46) between the ages of 35 and 54 years old. Of the 77 participants, 79.2% (n = 61) identified as male, 19.5% (n = 15) identified as female, and 1.3% (n = 1) identified as nonbinary. The highest represented race in this study was White, representing 85.7% (n = 66) of participants, while the next highest represented race, Hispanic, was only 5.2% (n = 4) of the participants. Participants represented all 12 Midwest states targeted in this study with the highest representation coming from Ohio (19.5%; n = 15), Minnesota (15.6%; n = 12), Illinois (11.7%; n = 9), and Indiana (10.4%; n = 8). All the participants were midlevel managers in manufacturing environments, and approximately half were production and quality managers (n = 20 and n = 18, respectively). Nearly 60% (n = 46) of participants had been in manufacturing for more than 20 years; however, 65% (n = 50) had only been in their current position for 4 years or less.

Table 2

Demographic Frequencies

		Frequency	Percentage
Age	18–24	1	1.3
	25–34	12	15.6
	35–44	22	28.6
	45–54	24	31.2
	55–64	17	22.1
	65+	1	1.3
	Total	77	100.0
Gender	Male	61	79.2
	Female	15	19.5
	Nonbinary	1	1.3
	Total	77	100.0
Race	Asian/Pacific Islander	1	1.3
	Black or African American	3	3.9
	Hispanic	4	5.2
	White/Caucasian	66	85.7
	Multiple ethnicity/other	1	1.3
	I prefer not to answer	2	2.6
	Total	77	100.0
State	Illinois	9	11.7
	Ohio	15	19.5
	Michigan	4	5.2
	Minnesota	12	15.6
	Wisconsin	4	5.2
	Indiana	8	10.4
	Iowa	5	6.5
	Missouri	2	2.6
	Kansas	4	5.2
	Nebraska	4	5.2
	South Dakota	3	3.9
	North Dakota	7	9.1
	Total	77	100.0
Current job title	Manufacturing plant manager	11	14.3
	Manufacturing production manager	20	26.0
	Manufacturing quality manager	18	23.4
	Manufacturing continuous improvement manager	11	14.3
	Manufacturing materials manager	2	2.6
	Other midlevel manufacturing manager	15	19.5
	Total	77	100
Length of time in manufacturing	1–4 years	3	3.9
	5–9 years	7	9.1
	10–14 years	13	16.9
	15–19 years	8	10.4
	20 or more years	46	59.7
	Total	77	100.0
	Less than 1 year	17	22.1
	1–4 years	33	42.9
	5–9 years	16	20.8
	10–14 years	8	10.4
	15–19 years	2	2.6
	20 or more years	1	1.3
	Total	77	100.0

I have included the mean and standard deviations in Table 3 for the independent variables, competence, relatedness, and autonomy as well as the dependent variable of level of lean implementation. The independent variables were each measured on a scale of 1 to 7, where 1 indicated low levels of participants' intrinsic needs of competence, relatedness, and autonomy being met and 7 indicated high levels of these intrinsic needs being met in their workplace. The dependent variable was also measured on a scale of 1 to 7, where 1 indicated a low level of lean implementation in their manufacturing organization and 7 indicated a high level of lean implementation in their manufacturing organization.

Table 3

Independent and Dependent Variable Descriptive Statistics

	M	*SD*
Competence	5.61	0.81
Relatedness	5.28	0.68
Autonomy	4.99	0.89
Level of lean implementation	3.82	1.58

Testing Assumptions

The first two assumptions the data needed to meet for multiple regression analysis were that one dependent variable was measured on an interval or ratio scale and two or more independent variables were measured on continuous or nominal scales (Laerd Statistics, 2013a). The dependent variable of level of lean implementation was measured on a Likert scale from 1 to 7. Since I used this scale as an interval from which I would be able to obtain mean and standard deviation information, it met the first assumption. I used three independent variables that were all measured on Likert scales from 1 to 7. Since

these scales are continuous and I used two or more independent variables, the second assumption was also met.

The third assumption was that residuals were independent of one another (Laerd Statistics, 2013a). I determined that there was independence of observations based on a Durbin-Watson statistic of 1.42. Next, linear relationships between the independent variables and the dependent variable were tested for. I first ran a scatterplot to check for the linear relationship between the collective independent variables and the dependent variable. I determined that this assumption was partially met since the residuals formed a horizontal band, as depicted in Figure 2. Subsequently, I determined that the partial regression plots for competence in Figure 3, relatedness in Figure 4, and autonomy in Figure 5, displayed approximately linear relationships with the dependent variable; therefore, the fourth assumption was fully met. The fifth test for assumption was for homoscedasticity or equality of variances (Laerd Statistics, 2013a). For this test, I evaluated the scatter plot in Figure 2 to ensure there were no patterns to the residuals, such as fan or funnel shaped. Viewing this scatterplot, it was determined that there was homoscedasticity and that the data passed this fifth assumption.

Figure 2

Scatterplot Test for Linearity and Homoscedasticity

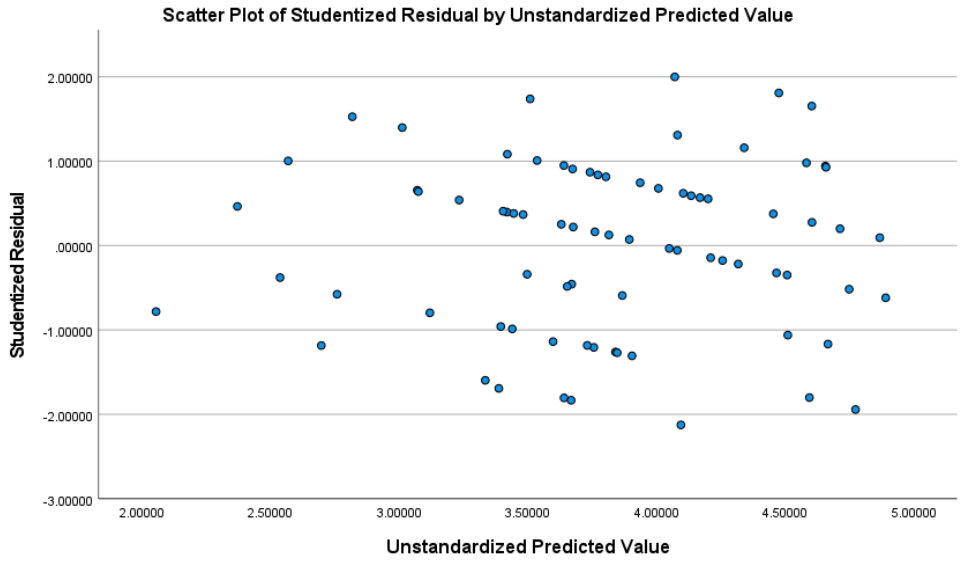


Figure 3

Partial Regression Plot: Competence

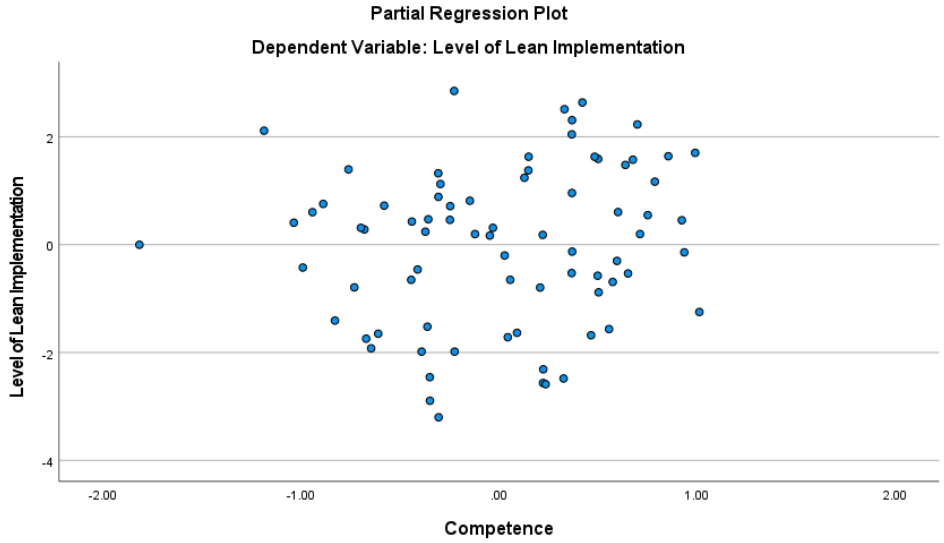


Figure 4

Partial Regression Plot: Relatedness

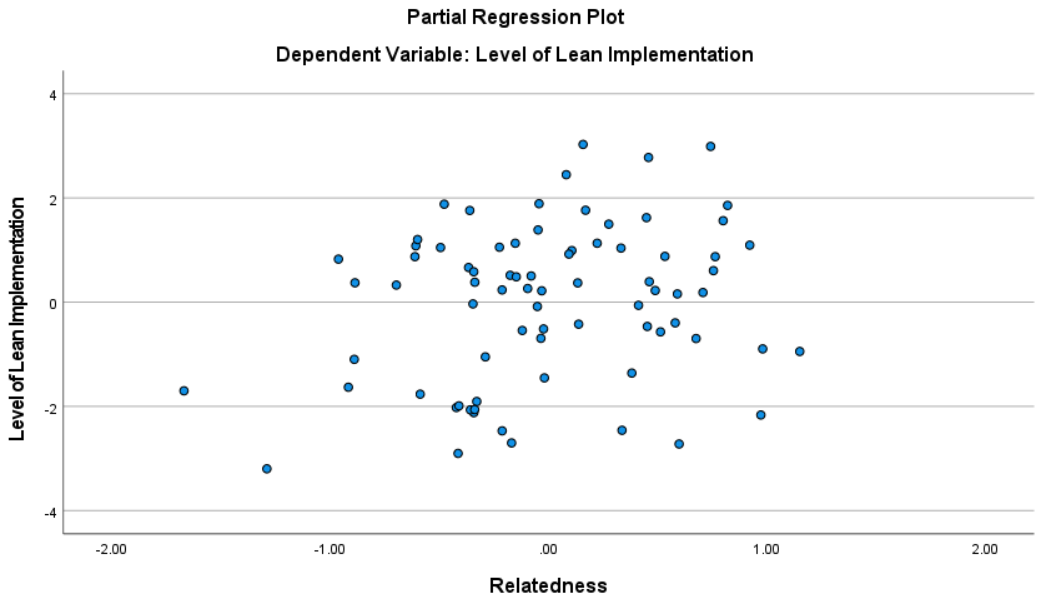
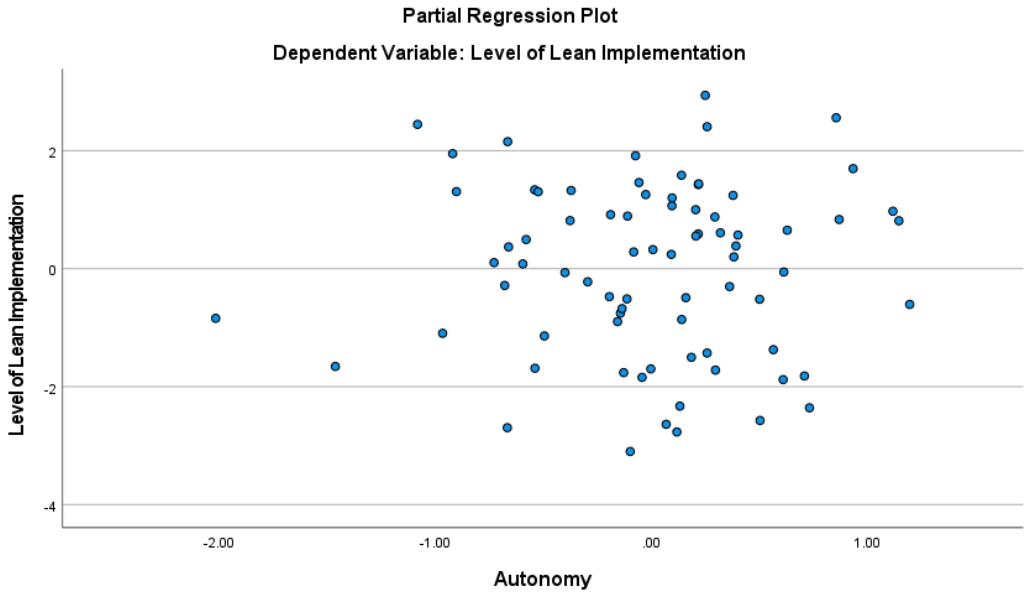


Figure 5

Partial Regression Plot: Autonomy



The sixth assumption was that multicollinearity did not exist (Laerd Statistics, 2013a). In other words, I needed to ensure that the independent variables were not correlated with one another. First, I ran a linear regression correlation test to ensure that none of the correlation coefficients for the independent variables in Table 4 exceeded 0.7. Next, I ran a tolerance and VIF test to ensure that all the tolerance values in Table 5 were greater than 0.1. After validating all the values in these two tables, I confirmed that the data met the sixth assumption.

Table 4

Linear Regression Correlation Coefficients

		Level of lean implementation	Competence	Relatedness	Autonomy
Pearson correlation	Level of lean implementation	1.000	.303	.355	.299
	Competence	.303	1.000	.406	.682
	Relatedness	.355	.406	1.000	.573
	Autonomy	.299	.682	.573	1.000

Table 5

Collinearity Statistics

	Collinearity Tolerance	Statistics VIF
Competence	.534	1.873
Relatedness	.672	1.489
Autonomy	.430	2.327

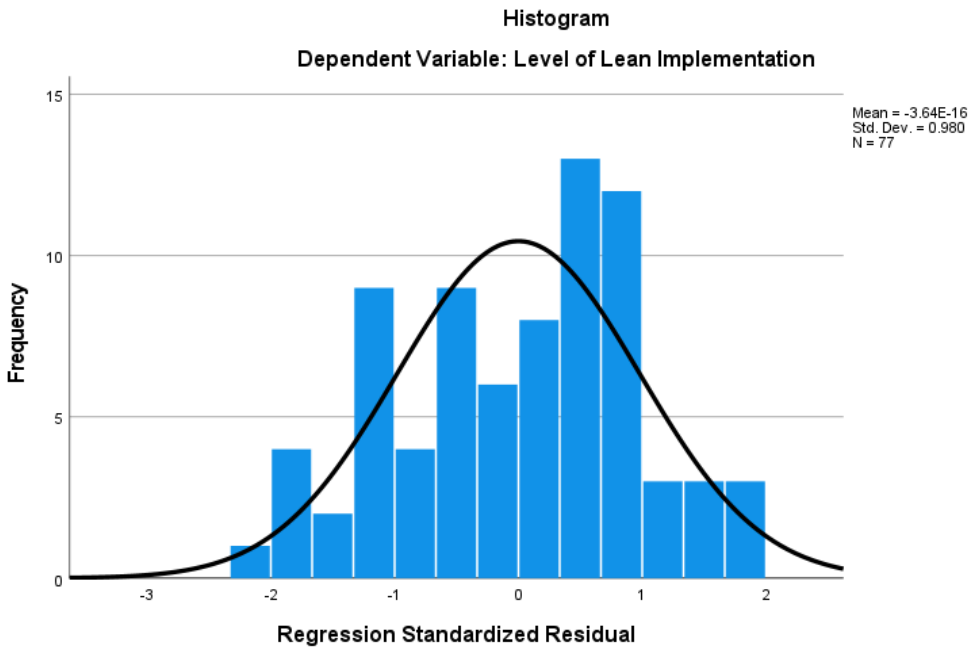
The seventh assumption was that there were no unusual data points in the data set (Laerd Statistics, 2013a). First, I ran a Casewise Diagnostics table to determine if there were standardized residuals greater than +/- 3 standard deviations from the mean. When this test was run, no table was produced in the output file, indicating that there were no cases greater than +/- 3 standard deviations from the mean. Therefore, I did not find any

outliers that I needed to remove. Next, I tested for high leverage points. The highest leverage point in the data set was 0.19447; therefore, since all data sets had leverage points below 0.2, I determined they were all safe to use and no data sets needed to be removed due to leverage points. Finally, I tested for influential points by ensuring Cook's Distance values did not exceed 1. The highest Cook's Distance value was 0.10081; therefore, there were no unusual data points in the data set that needed to be removed.

The eighth and final assumption was that residuals were approximately normally distributed (Laerd Statistics, 2013a). I tested this assumption by generating the histogram with a superimposed distribution curve in Figure 6. Since the mean was approximately 0 and the standard deviation was approximately 1, the data passed this assumption as well.

Figure 6

Histogram and Distribution Curve



Inferential Results

I conducted multiple regression analysis to evaluate how well competence, relatedness, and autonomy predicted the level of lean implementation in manufacturing organizations in the midwestern United States. I have provided the model summary of this analysis in Table 6. R^2 for the overall model was 15.7% with an adjusted R^2 of 12.2%, a small effect according to Cohen (1988). However, the model as a whole could statistically significantly predict the level of lean implementation, $F(3, 73) = 4.521$, $p < .01$. When testing the Beta coefficients for statistical significance of slope and linear relationships, I found that there was no statistically significant slope coefficient between competence, autonomy, and level of lean implementation. Relatedness was the only independent variable, with a significance of $p < .05$ and a 95% confidence level that does not cross 0, that had a statistically significant linear relationship with level of lean implementation. This linear relationship had a positive slope. The Beta coefficients and related confidence intervals are summarized in Table 7.

Table 6

Model Summary[b]

Model	*R*	R^2	Adjusted R^2
1	.396[a]	.157	.122

[a]Predictors: (Constant), autonomy, relatedness, and competence.
[b]Dependent variable: Level of lean implementation.

Table 7

Beta Coefficient Table

	Unstandardized B	Standarized coefficients beta	Sig.	95.0% interval lower bound	Confidence for B upper bound
(Constant)	-1.638		.284	-4.663	1.387
Competence	.346	.178	.231	-.225	.918
Relatedness	.627	.270	.043	.021	1.233
Autonomy	.040	.023	.890	-.541	.621

Data Analysis Summary

The purpose of this quantitative correlational study was to examine the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation. I collected data from 102 participants, resulting in 77 complete data sets with no missing fields. With the aim of using multiple regression analysis, I tested for the eight assumptions that data must pass to undergo multiple regression. There were no violations in assumption testing or were there any data outliers, leverage points, or influential points that I needed to remove from the data set. Analysis of the data revealed that the overall model was able to significantly predict level of lean implementation, $F(3, 73) = 4.521$, $p < .01$. The R^2 value of .157 is evidence that 15.7% of the change in level of lean implementation is predicted by competence, relatedness, and autonomy. Independently, relatedness had a statistically significant positive relationship with the level of lean implementation ($p < .05$). Therefore, I was able to reject the null hypothesis.

Comparison of Findings Within the Literature

In this study, I found that there was a positive relationship between middle managers' relatedness and level of lean implementation in manufacturing. Although I am

unaware of any studies specifically examining the relationship between relatedness and level of lean implementation, there are commonalities between existing literature and my findings. For instance, other researchers found that critical success factors for lean implementation included cultural shift and engagement from leaders and employees (Maware & Parsley, 2022; Williams, 2021). Concepts of lean used in TPS, arguably one of the most notable and successful lean manufacturing systems in existence, are rooted in culture (Sugimori et al., 1977) and require contribution and cooperation of all employees and leaders working together (Jönsson & Schölin, 2014; Winfield, 1994). My hypothesis relating to managers' relatedness adds to existing literature regarding the importance of building a cultural foundation of building upon the strengths of one another in the workforce to enhance successful lean implementation.

On the other hand, I found that there was no relationship between middle managers' autonomy, competence, and level of lean implementation in manufacturing. Inconsistent results among these two variables are common among existing literature. Some researchers found that actual competence on the job did not match perceived competence, which could misrepresent whether actual competence impacted performance (Chen et al., 2022). Furthermore, researchers have found mixed results on the relationship autonomy has on business performance (Clausen et al., 2022; Collie, 2022; Lachance-Grzela et al., 2022; Voorn et al., 2022; Yu et al., 2019). Specific to lean implementation, Tortorella et al. (2017) discussed how lean implementation should start with highly task-focused leadership. This could include a directive versus autonomous style; whereas, in later lean implementation phases, the relation-focused leadership may allow for more

autonomy among middle managers. It was interesting to note, in the current study, that most middle managers who participated were very early in their current positions, which could have impacted their competence level or the level of autonomy they felt they were given.

Interpretation of Findings Within the Theoretical Framework

The SDT is grounded in the belief that individuals in the workforce already have basic physiological needs met. Thus, the focus of the SDT are basic intrinsic needs for individual growth, development, and well-being in the workplace, which Deci et al. (1989) determined were competence, relatedness, and autonomy. Although I found a relationship between relatedness and level of lean implementation, there was no relationship with competence or autonomy and level of lean implementation. Tóth-Király et al. (2020) studied the SDT and found a need for balanced fulfillment of all three intrinsic needs. Therefore, individuals who only have their relatedness need met may not fully internalize lean implementation without also having the competence and autonomy needs met.

Applications to Professional Practice

Organizational leaders could apply SDT concepts and enhance intrinsic motivators among their middle managers to positively impact lean implementation in manufacturing. In this study, I found that relatedness had a positive relationship with the level of lean implementation in manufacturing. Understanding strategies to improve relatedness in the manufacturing environment could help leaders achieve higher success in lean endeavors. Leaders could use strategies identified by Deci et al. (1994) including,

providing a rationale for why a task is meaningful to the individual, acknowledging the individual's perspective that the activity is not enjoyable but essential, and using rhetoric consistent with choice to support a transition from introjected regulation to integrated regulation. The benefits of self-regulation through SDT include creativity, job satisfaction, OCB, and fully leveraging the knowledge and capabilities of employees (Gagné & Deci, 2005; Ryan et al., 2021), which are similar to the critical success factors of lean I identified in the existing literature.

Implications for Social Change

Leaders who effectively use lean strategies in manufacturing environments provide benefits beyond the bottom line for their organization alone. The social implications of successful lean implementation extend to the individuals impacted by the organization including manufacturing employees, their families, and their communities. Lean implementation and the SDT both have themes that involve leveraging the knowledge, skills, and capabilities of employees to the max, versus objectifying them (Gagné & Deci, 2005; Jönsson & Schölin, 2014; Ryan et al., 2021). This could lead to improved work-life balance, job satisfaction, and emotional health in the workplace. Subsequently, the financial and performance gains that organizational leaders could achieved through lean implementation may provide long-lasting jobs for sustainability within the community and enabling individuals to provide for their families.

Recommendations for Action

In this study I examined the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation in manufacturing. I found that

there was a statistically significant positive relationship between middle managers' relatedness and the level of lean implementation in manufacturing. Recommended actions for organizational leaders includes using the tactics Deci et al. (1994) determined could lead individuals from introjected regulation to integrated regulation. Fostering an environment where employees fully internalize tasks and feel that their assignments are consistent with their core beliefs could enhance self-regulation, thus relatedness, improving the level of lean implementation. The findings in this study could help senior level leaders in manufacturing enhance relatedness within their organizational culture as a precursor to lean implementation. I will share the results of this study through the Walden dissertations library and throughout my professional network, particularly colleagues within my organization across the United States.

Recommendations for Further Research

Future research is still needed to further understand the relationship between managers' intrinsic motivation and the level of lean in manufacturing. Some researchers have studied leadership styles related to successful lean implementation (Tortorella et al., 2017; 2019). However, I aimed to identify if a relationship existed between middle managers' competence, relatedness, autonomy, and level of lean implementation. Experiments conducted during the development of the self-determination theory involved controls and interventions regarding extrinsic motivators such as monetary compensation (Deci, 1971; Ilardi et al., 1993). Future research on this topic could include a control for extrinsic motivators to lessen the chance of external factors that could contribute to a

relationship or introduce the intervention in a controlled environment to identify if a cause-and-effect relationship exists.

My research was limited by geographic region. The participants for my study lived and worked in one of the 12 midwestern United States: Illinois, Ohio, Michigan, Minnesota, Wisconsin, Indiana, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota. Lean concepts have proven to be effective in the Japanese culture through the TPS, for example (Sugimori et al., 1977). However, leaders from cultures in other areas of the world have had less success in reaping the benefits of lean systems, from 10% in the United Kingdom to 26% in the United States (Jing et al., 2020). Future researchers could study the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation in other regions of the United States and the broader region of the country as a whole.

My primary means for soliciting participation was through social media, markedly LinkedIn. I relied on posting to my profile, posting on related group pages, and sending private messages to individuals within my network who appeared to meet the eligibility criteria for the study. I expanded my own network by searching for professionals using keywords, including the states of including in the study, "manufacturing," and "manager." The limitation of relying on social media excluded participants who do not participate or stay active in these networks. My recommendation for future research is to form connections with organizations of varying sizes and industries within manufacturing and offer paper, mail-in surveys to gain responses from a more representative group of individuals.

Reflections

Embarking on the journey to earn a doctoral degree was something that I never would have imagined I would pursue had I been asked a few or more years ago. I am an engineer, not a scholar, a researcher, and definitely not a writer. I am still unsure what triggered me to take this leap, but I could not be happier or more proud of myself for doing so. The personal and professional growth I have experienced over the last couple of years due to what I have learned through coursework and interactions with peers and professors has added a new dimension of expertise to my portfolio. I also learned that I could persevere through more demands, challenges, and setbacks than I could have anticipated at the onset, stretching myself to new limits. I am incredibly passionate about lean manufacturing and continuous improvement and will continue to relentlessly pursue insights and strategies that could lead to higher levels of successful outcomes.

I have worked in manufacturing environments for over 15 years, primarily in continuous improvement and process engineering roles. I have seen, first-hand, a broad spectrum of successes and failures in these efforts. During this time, I have often noted that the most difficult parts of my job are not the tactical, engineering improvements, but rather the change management and influencing of people. Now, as the influencer of others (middle managers) who I expect to influence individuals within their manufacturing plants to implement lean, I am eager to understand what could intrinsically motivate them to achieve success. I went into this study open-minded about what I may find. I was not surprised to find that relatedness was positively correlated

with lean implementation due to my experience with change management being the crux of success in lean implementation.

Conclusion

I conducted a quantitative correlational study to examine the relationship between middle managers' competence, relatedness, autonomy, and level of lean implementation. I analyzed data from 77 middle managers in manufacturing organizations in the midwestern United States. The result of this study was that middle managers' relatedness was statistically significantly positively related to level of lean implementation; therefore, the null hypothesis was rejected. This study was the first, to my knowledge, to address the relationship between the basic intrinsic needs of the SDT and level of lean implementation in manufacturing. The results of this study are valuable to senior leaders in manufacturing organizations as they address a relationship between relatedness and higher levels of lean implementation for overall improved business performance.

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Appendix: Questionnaire

In research, we often must present demographic information in categories. Additionally, screening questions enable researchers to ensure study participants meet eligibility criteria. The first 7 questions are for demographic, background, and screening information only. I understand that some of these labels are limiting. Please answer honestly, selecting the option that you best describes you, remembering that your answers are anonymous and confidential.

1. **What is your age in years?**
    - **a.** 18-24
    - **b.** 25-34
    - **c.** 35-44
    - **d.** 45-54
    - **e.** 55-64
    - **f.** 65 or older

2. **What is your gender identity?**
    - **a.** Male
    - **b.** Female
    - **c.** Non-Binary
    - **d.** I prefer not to answer

3. **What race/ethnicity best describes you?**
    - **a.** American Indian or Alaskan Native
    - **b.** Asian / Pacific Islander
    - **c.** Black or African American
    - **d.** Hispanic
    - **e.** White / Caucasian
    - **f.** Multiple ethnicity / Other
    - **g.** I prefer not to answer

4. **What state do you currently live and primarily work in?**
    - **a.** Illinois
    - **b.** Ohio
    - **c.** Michigan
    - **d.** Minnesota
    - **e.** Wisconsin
    - **f.** Indiana
    - **g.** Iowa
    - **h.** Missouri
    - **i.** Kansas
    - **j.** Nebraska
    - **k.** South Dakota

l. North Dakota
m. The state I live and primarily work in is not listed.

5. **What best describes your current working position?**
   a. Manufacturing Plant Manager
   b. Manufacturing Production Manager
   c. Manufacturing Quality Manager
   d. Manufacturing Continuous Improvement Manager
   e. Manufacturing Materials Manager
   f. Other Mid-Level Manufacturing Manager
   g. I am not a Mid-Level Manager in Manufacturing

6. **How long have you worked in manufacturing?**
   a. Less than 1 year
   b. 1-4 years
   c. 5-9 years
   d. 10-14 years
   e. 15-19 years
   f. 20 or more years

7. **How long have you been in your current position?**
   a. Less than 1 year
   b. 1-4 years
   c. 5-9 years
   d. 10-14 years
   e. 15-19 years
   f. 20 or more years

When I Am At Work

The following questions concern your feelings about your job during the last year. (If you have been on this job for less than a year, this concerns the entire time you have been at this job.) Please indicate how true each of the following statement is for you given your experiences on this job. Remember that your boss will never know how you responded to the questions. Please use the following scale in responding to the items.

1	2	3	4	5	6	7
not at all true			somewhat true			very true

1. I feel like I can make a lot of inputs to deciding how my job gets done.
2. I really like the people I work with.
3. I do not feel very competent when I am at work.
4. People at work tell me I am good at what I do.

5. I feel pressured at work.
6. I get along with people at work.
7. I pretty much keep to myself when I am at work.
8. I am free to express my ideas and opinions on the job.
9. I consider the people I work with to be my friends.
10. I have been able to learn interesting new skills on my job.
11. When I am at work, I have to do what I am told.
12. Most days I feel a sense of accomplishment from working.
13. My feelings are taken into consideration at work.
14. On my job I do not get much of a chance to show how capable I am.
15. People at work care about me.
16. There are not many people at work that I am close to.
17. I feel like I can pretty much be myself at work.
18. The people I work with do not seem to like me much.
19. When I am working I often do not feel very capable.
20. There is not much opportunity for me to decide for myself how to go about my work.
21. People at work are pretty friendly towards me.

The final question is intended to gauge your assessment of the level of lean implementation in your manufacturing organization.

On a scale of 1 to 7, with 1 being the lowest level and 7 being the highest level, how would you rate your manufacturing facility's **level of lean implementation** considering waste elimination, continuous improvement, zero defects, just-in-time, pull versus push, multifunctional teams, decentralization, integration of functions, and vertical information systems?

1	2	3	4	5	6	7
very low			moderate			very high