LEADERSHIP IN THE AGE OF ADVANCE TECHNOLOGY

by

Matthew Joseph Brancatelli

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Dissertation

Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

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Liberty University, School of Business

December 2024

Abstract

Invention has been the catalyst for societal advancement, altering human occupations, changing the business world, and bringing geographically separated societies closer. This case study research looked at the impact of advanced technologies on business leadership—digital transformation reshaping every aspect of the business world, including the people, processes, and platforms. An interview guide (Appendix A) was used with open-ended questions to gain insights into the problems and issues faced in manufacturing related to technology's impact on business leaders and the actions and behaviors an organization can develop to be better prepared to address emerging technology. The insights gathered in this study reveal the importance of striking the right balance between leveraging staff capabilities and integrating technological advancements. Leaders who desire to improve their general business practices should understand the application of employee engagement, clearly communicate expectations, develop employees, and drive technology into their operations. Effective leadership ultimately hinges on harmonizing these elements, ensuring that human and technological resources are utilized to their fullest potential.

Keywords: leadership, technology, manufacturing, skills development

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Dedication

This dissertation is dedicated to God, my pillar of strength, my guide, and my constant companion. Your unwavering support and divine guidance have been the beacon that illuminated my path.

To my beloved wife, Michelle, whose belief in me has never wavered and supported me on many late nights filled with self-doubt, encouraging me to keep going and pushing forward. To my children, Brent, Bailey, Kyle, and Konner, who inspire me daily with their boundless curiosity, joy, and sense of adventure. Your patience and sacrifices in supporting all my pursuits through the years will never be forgotten, and you have all made this achievement possible.

I would also like to dedicate this work to my parents, Frank and Linda, who instilled in me the value of hard work and perseverance, and to my brother, Micheal, whose encouragement and humor have always lifted my spirits.

This dissertation is a testament to the power of perseverance, hard work, and support from loved ones. It is a reminder that no goal is too big or unattainable if you keep pushing forward.

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Special recognition goes to the businesses and professionals who generously allowed me to interview them and open your businesses for this research. Your openness and willingness to share your experiences provided the rich data forming this research's backbone. Without your participation, this study would not have been possible. I would be remiss not to acknowledge my colleagues who offered their professional and personal support. Your encouragement and camaraderie have been a source of strength and motivation throughout this challenging endeavor. Lastly, I sincerely thank my family and friends for their unwavering support and understanding. Your belief in me has been a constant source of inspiration.

Table of Contents

List of Tables

List of Figures

Section 1: Foundation of the Study

Invention has been the catalyst for societal advancement, altering human occupations, changing the business world, and bringing geographically separated societies closer. Industrial revolutions have pushed these societal changes, altered cultural norms, and changed job design and tasking (Kretschmer & Khashabi, 2020). This study investigated the effects of advanced technology on the manufacturing sector as emerging technology accelerates, causing a gap in leadership skills compared to the speed of technological advancement. The study was accomplished through qualitative research with a flexible design utilizing a multiple case studies approach through a positivist paradigm.

This case study research looked at the impact of advanced technologies on business leadership—digital transformation reshaping every aspect of the business world, including the people, processes, and platforms. Artificial intelligence, machine learning, and big data provide mountains of data businesses must manage. Nevertheless, it is becoming evident that there is a leadership skills gap compared to the rate of technological advances. The general problem addressed is business leaders' inability to manage advanced technology due to a skills gap, resulting in lost revenue and business opportunities. Further refining this problem to a more specific scope delimits precisely to business leaders in Ohio's greater Cleveland metropolitan area manufacturing companies.

Cleveland, Ohio, metropolitan area was selected as the specific location due to the primary location of the researcher and their appreciation of the history of Cleveland, Ohio, being a lifelong resident of the area. Ohio's greater Cleveland metropolitan area became a pivotal manufacturing center during the post-Civil War Industrial Revolution. It was one of the fastest-growing cities in the American manufacturing belt regarding population and manufacturing

employment (Healey, 2014). Heavy industries flourished with the strategic location along Lake Erie and access to an abundant supply of raw materials (Fogarty et al., 2002). Cleveland rapidly developed into a manufacturing powerhouse. Manufacturing in the region emphasized materials processing and the production of more complex and precisely designed goods, ranging from auto parts to automobile assembly, pumps, office equipment, and household appliances.

The flourishment of the past for this region changed as high-tech growth was limited and unevenly distributed to other sections of the country (Rotman, 2023). The American manufacturing belt began to be called the Rust Belt, and other sections of the country's middle kept getting rustier. Even though the United States had impressive advances in artificial intelligence and other areas of high tech, the nation’s prosperity has largely benefited people in only a few regions, including San Francisco, Seattle, and Boston, which are booming. At the same time, the rest of the country suffers (Rotman, 2023). Therefore, Ohio's strong manufacturing history, presence, and heavy reliance on industry make it a relevant location for conducting this study on the effects of technology on leadership in the manufacturing sector.

In adapting to the rapid technological advancements within the manufacturing sector, senior leaders and middle managers must engage in proactive behaviors and actions to stay ahead, cultivating a culture of continuous learning and innovation. These proactive behaviors and actions involve keeping abreast of technological trends through ongoing education and training and fostering an environment where experimentation and risk-taking are encouraged. The participants of this study were senior organizational leaders, middle-management leaders, and front-line contributors in Ohio's manufacturing business in the greater Cleveland metropolitan area. The researcher conducted semi-structured interviews with senior organizational leaders and middle-management leaders. Meanwhile, front-line contractors completed a simple online

survey. Face-to-face interviews were conducted with 18 individuals representing 13 different manufacturing companies ranging in products from food and beverage, aviation components, contract metal machining, large format plastic products, specialty chemicals, automotive, and electrical components. Ten middle managers and eight senior leaders were interviewed for this research.

An interview guide (Appendix A) was used with open-ended questions to gain insights into the problems and issues faced in manufacturing related to technology's impact on business leaders and the actions and behaviors an organization can develop to be better prepared to address emerging technology. Utilizing a semi-structured interview guide allows the researcher to follow up with unforeseen questions that probe into participant answers and provide additional clarity of understanding. In interview question development, it was intentional to ask open-ended questions that would get the participants to discuss current issues faced in their Industry, the actions and behaviors the organization is doing to prepare their leader, and what attributes the organization desires in their leaders. The interview guide categorized questions based on three general areas: organizational culture, organizational innovation, and COVID-19 impact. A survey (Appendix B) was used as the main instrument for collecting data from front-line workers. Senior organizational leaders and middle-line managers will have the option to complete the simple nine-question survey, but that will not be the primary data collection point for the organizational leaders. The research examined how a business's or leaders' actions or behavior can influence leadership in managing emerging technology in their business section.

Background of the Problem

The background of the problem is the effects advanced technology has on the business sector, with emerging technology being developed at an accelerated rate, causing a gap in

leadership skills compared to the speed of technological advancement. The skills gap is due to technological advances causing organizations of all sizes to struggle with accelerated technology management due to scale, depth, and urgency to make organizational decisions (McCarthy et al., 2021). These accelerated technology changes have only been amplified with the global pandemic, causing inconsistencies in leadership skills and an unpredictable future. McCahery et al. (2021) stated that businesses failed in their forced adoption of new technologies at an alarming rate during the coronavirus pandemic. Digital transformation through emerging technology is much more than a support function. It includes artificial intelligence, social media, the internet of things (IoT), cybersecurity, big data and analytics, cloud computing, and robotic process automation (RPA; Kretschmer & Khashabi, 2020). Digital transformation through this list of emerging technologies will change business leadership as technological advances affect the human populace, altering organizations' physical reality into a digital reality. Organizations that miss the trend will be slower, less flexible, less competitive, and lose market opportunities (Zeike et al., 2019).

Emerging technology creates a skills set gap where business leaders need to find solutions to managing their current and future workforces, which potentially causes a loss of revenue and business opportunities (Card & Nelson, 2019). Bailey (2022) noted that emerging technology is not just a single changing entity but a dynamic force that intertwines all aspects of business into a constellation of functions. Bailey (2022) noted three areas where emerging technology affects organizations: emerging technology is increasingly autonomous and intelligent with the ability to supplement human cognition; increased backend analytics that create greater reach of tracking, monitoring, deciphering; and directing the behaviors of individuals and groups. The failed adoption of these forced new technologies happened at an

alarming rate, caused by market changes and political pressure on manufacturing to make business more environmentally sustainable. Both external pressures on manufacturing businesses have caused increased urgency around new technology adoption, resulting in business leaders making reactionary decisions that are detrimental to the current business climate.

Favoretto et al. (2022) noted that digital transformation involves changing a company's business model, affecting its value creation and proposition. The affected change in business models and processes raises the potential lost business revenue and limits the future opportunities of a manufacturing firm. Manufacturing firms seek new ways to leverage technology to increase revenues through digitally enabled advanced services (Kolagar et al., 2022). The idea is that through advanced technology, a firm sells more than its product; it also offers an adjoining service through a technology advantage. Sousa-Zomer et al. (2020) highlighted the importance of digital transformation for manufacturing firms and discuss the associated challenges of matching skills to the new technology but also the relationship that, in current times, digital transformation is dynamic and unending to maintain future opportunities.

McCarthy et al. (2021) referred to a digital workplace landscaper where the leader works to leverage technical resources to deliver innovative employee experience and engagement. This article looks to identify skill sets that business leaders need to manage digital transformation. The importance of leveraging technology in employee engagement and experience was also echoed by Bailey (2022), who call emerging technology a core component, and everyone, including business leaders, are theorists of technology. In this context, the leader using technology to focus on the employee resembles a technology-driven version of servant leadership. Servant leadership is a holistic approach that engages followers on many dimensions,

including relational, ethical, emotional, and spiritual levels, allowing the follower to grow (Eva et al., 2019).

The addition of technology changes the platform where the leader engages in their organization. Jackson and Dunn-Jensen (2021) wrote of the importance of ambidexterity as a leadership skill set related to a leader's learning capability to handle the overarching effects of digital transformation. Ambidexterity as a leadership skill resembles aspects of the adaptive leadership theory, which addresses leadership by providing a framework that the leader can accurately diagnose situations and then adjust behaviors and actions appropriately to meet the current conditions (Ohlsson et al., 2020). The literature review below covers the technological adaptation efficacy across multiple disciplines and points to a broad spectrum of necessary skills. This study identified leadership skills crucial to technology adaptation in Ohio's greater Cleveland metropolitan area manufacturing businesses. Establishing the background of the problem leads to defining the problem statement.

Problem Statement

The general problem to be addressed is the challenges business leaders face in managing advanced technology due to a skills gap, resulting in lost revenue and business opportunities. According to Card and Nelson (2019), emerging technology creates a skill set gap where business executives need to find solutions on how to manage their current and future workforces, which causes a loss of revenue and business opportunities. Jackson and Dunn-Jensen (2021) explained that business leaders do not understand the effects of digital transformation on business. Leaders do not have the necessary skills to lead their organization, resulting in lost revenue and business opportunities. McCahery et al. (2021) stated that during the coronavirus pandemic, businesses failed in their forced adoption of new technologies at an alarming rate,

resulting in lost revenue and business opportunities. Henderikx and Stoffers (2022) stated that organizations have focused on strategic leadership to lead a digital transformation. Still, there is a lack of information on the skills needed during and post-digital transformation of an organization. The specific problem to be addressed is the gap in business leaders' potential technology skills between managing manufacturing companies in Ohio's greater Cleveland metropolitan area, resulting in lost revenue and business opportunities.

Purpose Statement

The purpose of this flexible design multiple case study was to add and expand the understanding of why the leader struggles to lead during a time of quickly advancing technology, resulting in lost revenue and business opportunities. The research determined the driving factors behind the leadership skills gap and saw if there are specific actions and behaviors leaders can take to be more prepared to manage the effects of advanced technology. The more significant problem of the leadership skills gap will be explored through an in-depth multi-case study approach of manufacturing businesses in Ohio's greater Cleveland metropolitan area, working to define actions and behaviors that can be used to mitigate the effects of unpreparedness in advanced technology. Defining the specifics of the purpose statement leads to providing the research questions associated with this research.

Research Questions

RQ1. What is the role of business in preparing leaders to reduce the skills gap to manage rapid digital transformation successfully?

- RQ1a. What actions can a business take to prepare leaders to manage advanced technology?

- RQ1b. What behaviors can a business exhibit to prepare leaders to manage advanced technology?
- RQ1c. What actions can the leader take to be more prepared to manage advanced technology?
- RQ1d. What behaviors can leaders take to be more prepared to manage advanced technology?

RQ2. Why does a skills gap exist among business leaders to successfully manage rapid digital transformation?

- RQ2a. What leadership training does the manufacturing industry in the Cleveland metropolitan area currently utilize to develop its leaders?

RQ3. How can leaders' skills gap be reduced to manage rapid digital transformation successfully?

- RQ3a. How can reducing the leader skills gap in managing advanced technology improve business revenue generation?
- RQ3b. How can reducing the leader skills gap in managing advanced technology improve business opportunities?

The research questions provided direction to answer the specific problem statement. The research questions and sub-questions addressed the research methodology and fit into the positivism paradigm. The multi-case study approach provided the necessary real-world data needed to provide an analysis and assessment for business organizations. The research questions presented explored the problem concerning business leadership’s inability to be prepared to manage emerging technology. Through the research questions, the intent is to balance organizational and individual responsibility to reduce the effects of emerging technology on an

organization. Kolagar et al. (2022) noted that organizational culture plays a fundamental role in successful digital transformation, and overcoming the implementation of digital transformation lies in the organizational culture. This sentiment was the purpose of the research questions: to find the balance between organizational and individual responsibility.

Research question one and subquestions specifically look to gain insights into the actions and behaviors of the business leader to be better prepared to address emerging technology. In research question development, it was intentional to specifically ask the difference between actions and behaviors related to the business and leader. Actions are the mechanism of doing something, whereas behavior is more aligned with how a person acts (Mallpress, 2022). This study examined the influence of businesses and their leaders on their actions in managing emerging technology. Mallpress's (2022) research provides a greater taxonomy of behavior and how it is described, categorized, analyzed, and understood. In contrast, this study's research questions examined how a business's or leaders' behavior can influence leadership in managing emerging technology in their business section.

A leader’s unpreparedness is presumed due to a skills step gap and is reflected in an organizational decrease in productivity, efficiency, employee satisfaction, and organizational stability. The qualitative research questions are used to support and strengthen data collection and observation. RQ1, RQ1a, RQ1b, RQ1c, and RQ1d proposed identifying ways for a business to prepare leaders by diagnosing their actions and behaviors for the future. RQ2 and RQ2a attempt to discover why there is a skills gap in managing digital transformation. RQ3, RQ3a, and RQ3b highlight how organizational success can be accomplished by reducing the leader skills gap in managing rapid digital transformation.

Nature of the Study

The nature of the study was qualitative, with a flexible design and a multiple case studies approach with a constructivist paradigm. The case studies will explore the impact of advanced technologies on business leadership—digital transformation reshaping every aspect of the business world, including the people, processes, and platforms. Artificial intelligence, machine learning, and big data provide mountains of information businesses need to manage. Nevertheless, it is becoming evident that there is a skills gap to lead and manage compared to the rate of technological advances. The skills gap is due to technological advances causing organizations of all sizes to struggle with accelerated technology management due to scale, depth, and urgency to make organizational decisions (McCarthy et al., 2021). These accelerated technology changes have only been amplified with the global pandemic, causing inconsistencies in leadership skills and an unpredictable future. McCahery et al. (2021) stated that businesses failed in their forced adoption of new technologies at an alarming rate during the coronavirus pandemic. Digital transformation through emerging technology is much more than a support function. It includes artificial intelligence, social media, the internet of things (IoT), cybersecurity, big data and analytics, cloud computing, and robotic process automation (RPA) (Kretschmer & Khashabi, 2020). Business leaders should understand the impact of technology on their business sector so their businesses can adapt to the constant technological changes, maintain market share, and drive future opportunities. This paper intends to present an overview of a discussion of research paradigms, methods, and triangulation.

Discussion of Research Paradigms

Paradigms are conceptual and practical and are used to provide direction to solve specific research problems in social research (Kaushik & Walsh, 2019). Creswell and Poth (2018) noted

that paradigms are the basic sets that guide the study. Four design paradigms can be considered in the analysis: positivism, post-positivism, constructivism, and pragmatism. All four have merit in the examination, and it is the role of the researcher to align the correct paradigm design for the type of research that was conducted.

Post-positivism is regularly associated with quantitative research focusing on highly formal practices maintaining precision, generalizability, reliability, and replicability with controlled logically related steps (Kaushik & Walsh, 2019). Creswell and Poth (2018) discussed that post-positivism could also be used in qualitative research. The researcher would follow a structured approach in a series of logically related steps with a single objective reality. Post-positivism was not selected for this research due to the complexity of a rigid structure and the view that the researcher cannot be an independent observer in the study (Creswell & Poth, 2018).

Pragmatism as a paradigm embraces a plurality of methods. It is often associated with mixed methods or multiple ways with a proposition that researchers should use a philosophical and methodological approach that works best for the problem (Kaushik & Walsh, 2019). Researchers who use pragmatism as a paradigm can move beyond objectivist conceptualizations and are better equipped to deal with the complexity of individuals in social settings, like a business organization, who experience behaviors and actions differently (Kelly & Cordeiro, 2020). Pragmatism was not selected for this project as the paradigm because of its flexibility in truth, which balances imagination with practicality, limiting the questions on the problem's reality (Ellingson & Sotirin, 2020). A more structured approach with a more classic approach to the research is desired to understand the impact of advanced technology on business leadership.

Positivism was not selected for this research because it will facilitate findings on the potential leaders' skills gap related to advanced technology. There is a textbook mentality around

the positivism paradigm for quantitative research, and the constructivist paradigm is associated with qualitative (Gilad, 2021). Both research approaches involve varying types of data and analysis techniques. Irshaidat (2022) wrote that positivism is not designed to deeply comprehend how and why variables are sequenced. The investigator is detached from the test subjects and not personally or emotionally vested in the inquiry process (Irshaidat, 2022). It is believed that the positivist approach to research could be objective, but it was not selected for this study.

Constructivism is typically a qualitative method that seeks to understand the world by developing a subjective meaning of experiences relying on the participant's views of a situation (Kaushik & Walsh, 2019). Kaushik and Walsh (2019) noted that constructivism is a collaborative approach involving the research subjects in each step. Participation is associated with methods and rhetoric of advocacy and change. Bogna et al. (2020). discussed how constructivism seeks to identify an understanding of human beings within a subjective perspective within social contexts that depend on the beliefs and opinions that interact and interpret the situation. Aylward and Cronje' (2022) described constructivism as a realm in which learners learn by doing and facilitate the ability of learners to construct their meaning. The impact of advanced technologies on business leadership will have a human element in the research. Each subject will have its meaning of preparedness and technology from the next subject.

Pande and Bharathi (2020) discussed the seminal works of Paget (Lewin, 1988) and Rorty (1991) on how constructivism is focused on objectivity, relativism, truth, and forming a basic premise of a teaching and learning process. Three fundamental propositions define this process to portray the constructivist philosophical outlook, including

> understanding our interactions with the environment, cognitive conflict or puzzlement is the stimulus for learning and determines the organization and nature of what is learned, and knowledge evolves through social negotiation and the evaluation of the viability of individual understandings. (Pande & Bharathi, 2020, p. 4)

It is believed that understanding the environments in the research businesses and leaders will allow the greatest understanding of the phenomenon, which constructivism encourages. Constructivism was selected for this qualitative research to identify attributes of the phenomena. It will be the structure for the scientific knowledge management method, and this data collection method is appropriate for a qualitative business dissertation.

Discussion of Design

This study was conducted with a flexible design using qualitative methods. Specifically, a multi-case study design was used. A flexible design over a fixed structure was chosen because fixed plans are more rigid and tend towards quantitative research. In contrast, qualitative research is context-dependent, and the researcher uses the shared experiences of the research subjects to develop a holistic account of the problem (Creswell & Poth, 2018). This research strategy aimed to understand the skills needed by business leaders and the actions and behaviors that support leading and managing an organization through emerging technology changes. Their leaders need to manage their organizations more effectively through changes in advanced technology. Qualitative research questions assisted the research in triangulating the potential reasons for the leadership skills gap in dealing with advanced technology and the role of business in being prepared for future technological changes. A flexible design of multiple case studies addressed the specific problem of exploring the possible reasons for business failure to prepare

leaders to handle the rapid digital transformation in the manufacturing industry in Ohio's greater Cleveland metropolitan area.

Discussion of Method

Three primary methods can be selected in research: qualitative, quantitative, or combination. Quantitative social research focuses on measurement and quantification, adhering to a specific scientific approach while maintaining objectivity and distance between the researcher and participants (Robson & McCartan, 2016). Qualitative social research, in contrast, utilizes verbal and written study in non-numerical form, and inductive logic is used in presenting the data collected; objectivity is not valued, and the context of the information is viewed as essential to the participants (Robson & McCartan, 2016). Robson and McCartan (2016) noted that some researchers attempt to combine qualitative and quantitative into a hybrid method. Still, that method can be complex and entirely compatible depending on the research problem. Nguyen and Tull (2022) noted that qualitative research should be well-positioned to capture the rich contextual dynamics of complex international business phenomena and case-based research design alternatives that can incorporate analytical and explanatory power over the context. Ellingson and Sotirin (2020) noted that qualitative research is more often human-focused on collecting data through observations, interviews, audiovisual material, and documentation to understand people’s experiences, actions, behaviors, and beliefs. The research on leaders’ and businesses’ actions and behaviors related to management in a time of advanced technology makes the qualitative method the best choice for this research. The qualitative method was selected for this research as it was more consistent with a study of business leadership and the effects of advanced technology on that organization.

Flexible design qualitative research can be conducted through phenomenological methods, a single case study, or a multiple case study design. A phenomenology design has a solid philosophical component and focuses on the philosophical assumptions of the lived experiences of persons (Creswell & Poth, 2018). Phenomenology-based research is a viable approach to conducting qualitative research as it is more than just telling a story of people's experiences; it is seen as narrative design research. Phenomenology deliberately is a dynamic interplay that looks at the consciousness of being in the world and what/how those shape human experience (Horrigan-Kelly et al., 2016). The phenomenological attitude is the intentionality of consciousness of suspending the natural philosophy in favor of transcendental reduction (van Manen & van Manen, 2021).

Hoorani et al. (2019) described case study research as a theory-building, testing, and refinement method. It is an empirical method that looks to "investigate contemporary phenomenon (the "case") in depth and within its real-world context" (Yin, 2018, p. 15). The key to reducing these challenges in case study research is to have robust transparency about the features of the case study research, which is essential to creating trustworthiness in conclusion (Massaro et al., 2019). The research is not defined by the method, but the issue has parameters that help the researcher work towards a theory on the phenomenon. The ability to define the research parameters is why a multiple case study design was selected for this research, conducting surveys, interviews, and observations of manufacturing businesses in Ohio's greater Cleveland metropolitan area to determine the impact of advanced technology on business leaders.

The research for this project was accomplished through a flexible design multi-case study approach. According to Creswell and Poth (2018), case study research is qualitative, exploring

real-life contemporary systems through detailed data collection involving multiple sources of information, including observations, interviews, audiovisual material, and documentation. Methodology in research provides the audience with the process used by the researcher to develop the supporting data and the validity and reliability of the study.

Discussion of Triangulation

The research conducted addressed the problem of the effects of a gap in leadership skills compared to the rate of technological advance regarded triangulation as a research mindset promoting methodological diversity that lead to qualitative scientific discoveries. In their writing, Nielsen et al. (2020) related methodological diversity to the necessary rigor in research to reduce any biases, errors, or limitations that could be experienced in a single data collection form. Denzin (2017) documented four types of triangulation: data triangulation, observer triangulation, methodological triangulation, and theory triangulation, as cited in Robson and McCartan (2016). Data triangulation uses multiple methods for data collection, including observation, interviews, surveys, and document review (Robson & McCartan, 2016). Robson and McCartan (2016) noted that observer triangulation is a method where one observer supports the triangulation, methodological triangulation combines quantitative and qualitative approaches, and theory triangulation uses multiple theories or perspectives. For this research, observer and methodological triangulation were not used, and they were rejected. Methodological triangulation is the convergence of multiple methods upon a single conclusion to support a better conclusion (Heesen et al., 2019). Multiple methods may support a better conclusion, but this research adds unnecessary complexity, time, and resources that will bring enough value.

For this research, two types of triangulations were used: data and theory. Multiple data sources, including observations, interviews, audiovisual material, and documentation, lead to

methodological rigor established by the researcher setting standards for the research process, including the study's data collection, analysis, and reporting. Data and theory triangulation were sufficient for this study and provided a greater understanding of the effects of emerging technology on business leadership in Ohio's greater Cleveland metropolitan area manufacturing sector.

Data triangulation strengthens construct validity in case study research by using multiple data sources and provides different measures for the same phenomenon (Farquhar et al., 2020). Theory triangulation was used to help understand the leadership skills gap of business leaders through the lens of existing management and leadership theories. Denzin (2017) outlined three steps for theoretical triangulation consisting of (a) defining the theoretical perspectives, (b) data analysis through a theoretical lens, and (c) theory-building account with sensitivity to fresh theoretical insights (Farquhar et al., 2020).

Qualitative researchers strive for a greater understanding and deep knowledge structure by working with participants, readers, and themselves to obtain detailed meanings to research questions (Creswell & Poth, 2018). In this qualitative research, it was essential to show the credibility of the research methods and have multiple means to validate the data. Triangulation is the avenue to address both validity and reliability through the corroboration of sources through the convergence of various interpretations, perceptions, and experiences (Farquhar et al., 2020). Qualitative research methods that were used included interviews, surveys, and observations of business leaders in Ohio's greater Cleveland metropolitan area manufacturing businesses. This data validation was accomplished through triangulation, a multi-level approach that builds trust with reviewers on the transparency of the research presented. Methodological rigor is essential for the researcher to set standards for the research process, including how data will be collected,

data analysis and storage, and reporting of the study (Nielsen et al., 2020). Quantitative methods used in this research were the demographics of the business's manufacturing firms, including revenue, employees, gender composition of business leaders, and business longevity, to provide context on the experience of the research participants. Establishing the nature of the study leads to providing the conceptual framework of this study.

Summary of the Nature of the Study

In summary, a positivist flexible design multi-case study utilizing qualitative methods was used in research to understand the effects of advanced technology on business leaders, potentially causing an inability to manage advanced technology due to a skills gap. The positivist worldview allowed the researcher to understand the research participants and their actions and behaviors related to cutting-edge technology. This study isolated to manufacturing companies in the Midwestern United States. The qualitative methods of this study provided the initial structure for the research but are flexible enough to adjust, allowing ideas to emerge through continued analysis, comparison and review of specific outcomes.

Conceptual Framework

The conceptual framework of this study supported qualitative research with a flexible design utilizing a multiple case studies approach with a positivism paradigm. Through case studies, this research looked at the impact of advanced technologies on business leadership—digital transformation reshaping every aspect of the business world, including the people, processes, and platforms. Artificial intelligence, machine learning, and big data provide mountains of data businesses must manage. Henderikx and Stoffers (2022) noted the changes in leadership and management compared to the rate of technological advances and note the evolution of leadership traits and skills to adapt to this change in the business environment.

The conceptual framework for this study was based on the concept that to reduce the leadership skills set gap, a leader needs to understand transformational leadership, adaptive leadership theory, and situational leadership approach. These three principles create the need for the organization to change due to changes in the business environment. The skills gap is due to technological advances causing organizations of all sizes to struggle with accelerated technology management due to scale, depth, and urgency to make organizational decisions (McCarthy et al., 2021). Transformational leadership led to the skills of adaptable leadership theory, followed by the situational leadership approach, which supports the assumption that a leader would need these skills to succeed.

Emerging technology will change the business landscape. Sixty-two percent of business executives believe they must adjust 25% of their workforce by 2023, either retraining existing workers or rehiring new workers to meet the technological changes (Card & Nelson, 2019). The disruption of 25% of the workforce will cause leadership challenges in every business segment. According to Howard (2019), the impact of artificial intelligence on the safety, health, and well-being of employees and their work is still unknown. Executives need a proactive approach to ensure the viability of their organizations. Business leaders need to understand the impact of technology on their business sector so their businesses can adapt to the constant technological changes, maintain market share, and drive future opportunities.

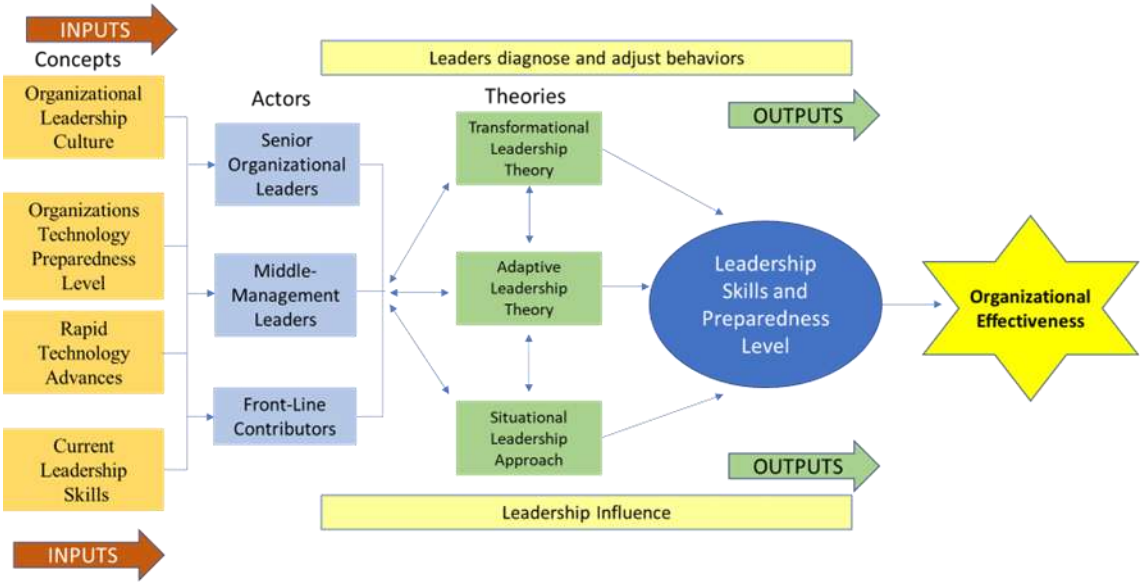
Diagram and Concepts

A Skills-Set Gap Exists Between Business Leaders in Managing Emerging Technology. The concept of a leadership skills set gap exists between business leaders in managing emerging technology. Digital transformation through advanced technology is rapidly and fundamentally changing business. This concept supports the problem of this research, as

leaders are left flat-footed and ill-prepared to make decisions within the required timeline. Nair (2019) estimated that by 2021, businesses would spend two trillion dollars on hardware, software, and technology-related services. Fifty percent of organizations surveyed believe a significant digital talent skills gap is increasing daily with the introduction of newer technology (Nair, 2019). This rapid advancement of technology makes leading an organization challengingly dynamic.

Figure 1

Relationship Between Concepts



Business organizations can no longer look for the compliant team players of the past that would blend into a traditional business setting. Still, in current times, businesses need teams engaged and spirited team members working on solutions to problems (Heckscher, 2021). Heckscher (2021) stated that engagement leads to team innovations through passionate communication that moves through internal conflict constructively. The challenging aspect for a leader is the ability to facilitate these spirited interactions civilly and maintain focus on corporate objectives. The concept of a business leader's skills-set gap in managing emerging technology

underscores the specific problem statement. Cleveland metropolitan area's manufacturing companies are dealing with a technology skills-set gap that can potentially limit strategies, resulting in lost revenue and business opportunities.

Identifying Emerging Technology is Dependent on Leader Preparedness. Digital transformation through emerging technology will change business leadership as technological advances affect the human populace, altering an organization's physical reality into a digital reality. Jackson and Dunn-Jensen (2021) explained that business leaders do not understand the effects of digital transformation on business, and this understanding is a necessary skill to lead an organization into the future. Digital transformation in the economy has opened newer avenues for companies to compete more efficiently in the market but poses considerable challenges for workforce management. A study by Deloitte (2015) showed that 91% of employees believe digital transformation will affect their work (Jackson & Dunn-Jensen, 2021). Still, only 41% believe the preparation by their employers will adequately deal with future technology (Jackson & Dunn-Jensen, 2021). This low percentage of employees with confidence in their employer's ability to address advanced technology changes creates a leadership challenge affecting organizational culture.

Henderikx and Stoffers (2022) noted that only some studies have focused on middle managers and their explorative study on the influence of digitalization on middle managers' future leadership skills, behaviors, and management practices. Emerging technology is not just a single changing entity but a dynamic force that intertwines all aspects of business into a constellation of functions (Bailey, 2022). Business leadership is also not a single chasing entity and will need to mirror the dynamic force of advanced technology to lead their organizations into the future.

The Coronavirus Pandemic Forced the Adaption of New Technologies at an Unexpected Rate. McCahery et al. (2021) stated that businesses were unexpectedly forced to adopt new technologies during the coronavirus pandemic. This adoption rate moved new technologies to businesses at an alarming rate, resulting in lost revenue and business opportunities for many organizations. The coronavirus pandemic was unprecedented in modern times and led to a business crisis that was hugely disruptive and complex and created ambiguity for leaders (Collings et al., 2021). Organizations were forced to change their operating standards and how they manage their human capital (Seaton et al., 2021). Seaton et al. (2021) noted that just because of the rapid changes in the business environment, businesses should not necessarily change just for the sake of changing but base any changes on strategic models based on theory research with defined validation.

Organizational Leadership Culture. According to Asadi and Stefanescu (2019), organizational leadership culture affects human resource leaders' ability to choose the appropriate leadership style and training to move the organization forward to meet short-, medium-, and long-term strategic objectives. According to Wallace et al. (2021), organizations pour billions of dollars into leadership development training to develop a leadership culture that will give them a competitive advantage. This competitive advantage stems from recruiting leaders and developing internal leadership capacity within the organization (Wallace et al., 2021). Despite the money invested, there is a lack of indicators that show the effectiveness of the investment in development (Wallace et al., 2021). Organizational leadership culture should be considered a direct relationship between the corporate culture and strategic performance outcomes, and it is a variable related to the specific problem. This relationship can be accomplished through either a self-management approach where the development is based on the

needs of the individual or in a participatory approach that involves organizational needs and targets of a group of leaders (van Tuin et al., 2020). Organizational leadership culture through leadership development as a business function relates directly to the problem statement regarding the impact on business performance (van Tuin et al., 2020).

Theories

Transformational Leadership Theory. Transformational leadership theory relates to the specific problem as it is an encompassing approach that can play a pivotal role in precipitating change and allow a leader to promote fundamental changes needed for long-term survivability in times of change. Transformational leadership is a process that transforms people into being concerned with emotions, values, ethics, standards, and long-term goals (Northouse, 2019). Most importantly, it describes how a leader can initiate, develop, and carry out significant organizational changes to meet a strategic objective (Northouse, 2019). This theory should be considered the first step in reducing the leader skills set gap as a leader will have to gain the trust of their followers, empowering them to be successful in an environment through constant change and emerging technology.

Northouse (2019) continued describing transformational leadership as a process in which leaders raise the motivation and performance of both the leader and the follower in pursuit of innovation. Through their research, Afsar and Umrani (2020) focused on the role of transformational leadership influencing employees' innovative work behavior, noting that the leader's attention to supporting the followers' engagement can directly relate to increasing innovation and creative activities. Afsar and Umrani's (2020) work supports Northouse's thoughts that the leaders' skill set is essential in transforming the organization and assumes transformational leadership, in turn, helps an organization through emerging technology.

Adaptative Leadership Theory. The adaptive leadership theory addresses a possible solution to the specific problem. It promotes flexibility in leadership and promotes the fact that business leaders need to prepare for ambiguous contextual and environmental demands. Adaptive leadership theory is a follower-centered practice where leaders are concerned with how their followers change and adjust to new circumstances (Northouse, 2019). Northouse (2019) stated that adaptive leaders focus on others by mobilizing, motivating, organizing, and orientating their followers to learn new ways of living to effectively meet the day's complex challenges. As advanced technology changes the business world, it is plausible to believe that adaptive leadership can help leaders be more prepared to lead and manage emerging technology and reduce the leadership skills gap.

Uhl-Bien and Arena (2018) wrote that leaders' most significant challenge is the ability to position and enable their organizations to adapt to a dynamic and demanding environment. The article touches on sources of innovation and disruption facing businesses and organizations. This thought was a pre-coronavirus world, which only magnifies the disorder seen in the world. Ohlsson et al. (2020) highlighted how adaptive leadership provides business leaders with a framework to accurately diagnose situations and adjust behaviors appropriately to meet the problem, such as rapid technological advances. The world's complexity today shows that organizations must adapt to a framework that enables leaders to adapt quickly in the face of complexity and unexpected pressures.

Situational Leadership. The situational leadership approach addresses a possible solution to the specific problem as it promotes both a directive and supportive dimension and provides business leaders with the tools to be adaptable in a constantly changing business environment. Leaders who use the situational leadership approach can recognize when they need

to be directive or supportive and adapt their style to meet the needs of the individual and, ultimately, the organization (Northouse, 2019). Followers will advance and regress at different points in a development continuum, and leaders must adapt accordingly (Afsar & Umrani, 2020). The premise is that as emerging technology changes the business environment, the task behavior of the individual will change, and leaders will need the skill set to understand these changes and adjust their actions and behaviors to meet the current situation. In theoretical constructs, the adaptable and situational leadership models complement each other, and a leader must utilize both theories in tandem.

Princes and Said (2022) researched the effects of situational leadership and how it appeals to the financial performance of projects. The idea is that a business's economic sustainability is achieved through performance readiness, where a leader can blend complex situations between directive or supportive actions and behaviors to reduce business complexity and achieve financial sustainability. Emerging technology is known for business disruption, and the skill set of situational leadership approaches will provide the skills and tools leaders need to succeed. A potential key to the future world is the performance readiness of an organization that is adjusted to handle emerging technology. The differing situations of the world today show that organizations need the tools to allow leaders to adapt in directive or supportive manners in the face of complexity and unexpected technological pressures.

Actors

Senior Organizational Leadership

Senior organizational leaders provide strategic direction over a business and guidance for training and technology. Leaders must be concerned with production and considerate of the people responsible for the work. These senior leaders are directly connected to the specific

problem in that they are the center of the decision-making process regarding preparing leaders to handle advanced technology.

Middle-Management Leaders

Middle-management leaders are directly connected to the specific problem as they are transformational leaders able to identify the necessity of change and motivate front-line managers and followers to transcend their self-interests for the good of the team and organization (Farahnak et al., 2020). This group of middle-management leaders as actors play a direct role in executing the organization's strategic vision and provide day-to-day guidance to front-line supervisors and individual contributors who perform the work related to technology adaptation.

Front-line Contributors

Front-line contributors are the actors within the organization that execute the tactics at the direction of management to accomplish the strategic objectives. Front-line contributors directly connect to the problem as they support organizational goals through their direct work assignments utilizing resources to create organizational change. Figure 1 above relates to how businesses must identify emerging technology as dependent on leader preparedness. This preparedness recognizes emerging technology, diagnoses organizational technology deficiencies, and adjusts behaviors to increase business effectiveness. The adaptive leadership theory and situational leadership approach relate to business leaders' preparedness for organizational success, as leaders need to be agile, reactive, and engaged during a digital transformation. The figure refers directly to senior corporate leaders identifying the need for change, the adaptive leadership theory, front-line contributors, and organizational preparedness. The final aspect of the figure highlights how senior organizational leaders need to influence corporate behavior and adjust the culture that leads to organizational success.

Constructs

Leadership Skills

Leadership skills relate to organizational resilience, providing leaders with a multi-discipline and multi-dimensional understanding. This understanding allows leaders to anticipate, prepare, respond, and adjust to sudden disturbances in the business environment (Suryaningtyas et al., 2019). Ngayo Fotso (2021) wrote about how the leadership competencies of the industrial phases of the past are no longer relevant in the digital age, and the world today is a constantly changing, uncertain, and complex environment. In their literature review, van Laar et al. (2017) touched on seven core skills that a leader must couple with five contextual skills. The seven core skills referenced were technical, information management, communication, collaboration, creativity, critical thinking, and problem-solving (van Laar et al., 2017). The five contextual skills were ethical awareness, cultural awareness, flexibility, self-direction, and life-long learning (van Laar et al., 2017). It is believed that through this research, core and contextual skills will be the constructs and variables between successful and unsuccessful leadership in Ohio's greater Cleveland metropolitan area manufacturing businesses. Considering leadership skills as a function of business performance directly relates to the specific problem as leaders provide the influencing behavior and actions that influence the constructs of an organization in their strategic objectives.

Concepts

Concepts in the research study internal to an organization will include the current leadership skills of management, organizational leadership culture, and the organization's technology preparedness level. The external variable will be the rapid technological advancement in society and how it affects each organization. Rapid technological progress in

society is seen in the 50 billion 5 G-connected devices estimated to be part of the internet of things by 2025 (Sharma et al., 2022). These 5G-enabled devices will deliver "1000 times higher data volumes, 100 times higher data rates, ten times lower energy consumption, five times lower end-to-end latency with 99.999% service reliability" (Lundgren et al., 2021, p. 71). Lundgren et al. (2021) noted that there is no complete understanding of how the internet will impact business. Still, they believe the current direction will radically change manufacturing technology, increasing performance.

The research collected qualitative data points: interviews, surveys, and observations of business leaders in manufacturing businesses in Ohio's greater Cleveland metropolitan area. The quantitative data points collected in this research were the demographics of the business's manufacturing firms, including revenue, employees, gender composition of business leaders, leader's education level, age, and business longevity, to provide context on the experience of the research participants. The validation of all data points is accomplished through triangulation, a multi-level approach that builds trust with reviewers on the transparency of the research presented.

Data analysis in this case study used two different analytic techniques to increase the reliability of the study. The two analytical techniques used are explanation building and cross-case syntheses. Yin (2018) described explanation building as a technique that aims not to conclude the study but to develop further ideas that help explain the phenomenon. In a multi-case study approach, the data collected from the first case study is compared to the next, with the intent to lead to further revision, repeating as many times as needed (Yin, 2018). The second technique used is cross-case synthesis, complementing the explanation-building technique. Cross-case synthesis is viewed as a case-based rather than a variable-based approach where the

goal is to retain the integrity of the case and then compare and synthesize any cross-case patterns (Yin, 2018). The intent was to keep the integrity of each organization reviewed in a holistic format while building on that information and analyzing for comparisons as part of the data analysis.

Relationship Between Concepts Theories, Actors, Constructs, and Variables. The specific research problem and questions focus on the business leaders' inability to manage advanced technology due to a skills gap. The concepts used in this research informed those theories to develop solutions from practical, real-world situations and build on existing ideas and concepts. Once created, implemented theories will assist in understanding real-world research through data and supported assertations. Together, concepts, theory, actors, constructs, and variables build an account and a solution to the problem. Figure 1 above relates to how businesses must identify how internal and external concepts affect leader preparedness. This preparedness recognizes emerging technology, diagnoses organizational technology deficiencies, and adjusts behaviors to increase business effectiveness. As these concepts affect business leaders, utilizing existing theories could affect leadership skills and preparedness. The adaptive leadership theory and situational leadership approach relate to business leader preparedness for organizational success because leaders need to be actively engaged and react during a digital transformation. Figure 1 refers directly to senior corporate leaders identifying the need for change, the adaptive leadership theory, front-line contributors, and organizational preparedness. The final aspect of the figure highlights how senior organizational leaders need to influence corporate behavior and adjust the culture that leads to organizational success. Providing the conceptual framework for this study leads to establishing the definition of critical terms.

Summary of Research Framework

In summary, this research is relevant to business management as it will provide direction and focus to an organization in establishing the need for training, objectives, and the approach to reach effective organizational leadership. To understand why and how the problem of leaders being able to manage emerging technology to concepts of leadership preparedness and the impact on the success of an organization. The critical points of the research concept are that theories build upon the concepts and highlight how leadership strategies may overlook the preparedness of business leaders. Senior leaders, middle managers, and front-line leaders need to understand how each tier of leadership perceives the impact and consequences related to leadership preparedness caused by emerging technology. Concepts internal to an organization will include the current leadership skills of existing management, organizational leadership culture, and the organization's technology preparedness level. The external variable was the rapid technological advancement in society and how it affects each organization. Opportunities will arise to administer adjustments as needed to explore better the specific problem, which is to address the reason that there is a skill gap in business to prepare leaders to handle the rapid digital transformation in manufacturing companies in the greater Cleveland area of Ohio, resulting in potentially lost revenue and business opportunities.

Definition of Key Terms

The following terms were included to clarify for the reader, as they were frequently used in this research project and existing literature.

Adaptive leadership: Adaptive leadership focuses on the adaptations required of people in response to changing environments to prepare and encourage leaders to deal with change (Northouse, 2019).

Advanced technology / emerging technology: New technologies that have the potential to fundamentally shape all aspects of organizing artificial intelligence, including data analytics, robotics, digital platforms, social media, blockchain, and 3-D printing (Bailey, 2022).

Artificial intelligence: "The ability of a machine to simulate human intelligence and execute human-like tasks; in some cases, it can also learn from experience and adjust to new inputs" (Henderikx & Stoffers, 2022, p. 5).

Big data and analytics: "The ability to process high volumes of fast-paced incoming and outgoing data to analyze it, prioritize, and make sense of the relevant information for decision-making" (Henderikx & Stoffers, 2022, p. 10).

Digital transformation: Digital transformation is the widespread adoption and application of digital technologies and innovation to support business models that drive growth and competitive advantage (Kretschmer & Khashabi, 2020).

Internet of Things (IoT): "A system of interlinked electronic and computing devices characterized by the amalgamation of digital and physical elements to produce innovative and creative business models where data can be transferred within a network without the involvement of humans." (Jain & Ajmera, 2021, p. 1235)

Leadership development: The act of developing one person's skills to influence the behavior of an individual or group regardless of the reason (Hersey et al., 2013).

Machine learning: Machine learning is a subset of artificial intelligence that recognizes patterns in data and then sets of methods that can automatically detect patterns in data and use those patterns to predict future data or to perform other kinds of decision-making under uncertainty (Kinkel et al., 2022).

Robotic process automation (RPA): RPA is an emerging technology that automates rule-based tasks to increase process efficiencies and reduce costs (Wewerka & Reichert, 2023).

Situational leadership: "A leadership process that stresses that leadership is composed of both a directive and a supportive dimension and that each must be applied appropriately in each situation; and the leader must evaluate their follower on how competent and committed they are in performing a given goal." (Northouse, 2019, p. 163)

Skills gap: The deficiency in either soft or hard skills that allow a leader to achieve organizational success (Akdur, 2021).

Transformational leadership: "A leadership process that changes and transforms people concerned with emotions, values, ethics, standards, and long-term goals satisfying their needs and treating them as whole human beings" (Northouse, 2019, p. 163).

Establishing the definition of key terms for this study leads to providing this research's assumptions, limitations, and delimitations.

Assumptions, Limitations, Delimitations

Assumptions, limitations, and delimitations are items that qualitative researchers need to manage to enable them to frame the context of their research correctly, allowing the reader to understand the research limitations and associated concepts. Doing so provides the frame of reference for the reliability and validity of the qualitative research. According to Spiers et al. (2018), over the last 18 years, verification strategies for reliability and validity in qualitative research have been one of the most downloaded articles in research due to the importance of framing analysis correctly for the audience. Qualitative researchers strive for a greater understanding and deep knowledge structure by working with participants, readers, and themselves to obtain detailed meanings to research questions (Creswell & Poth, 2018). Creswell

and Poth (2018) summarized and provided their thoughts on validation as the continued and evolving construct that utilizes both traditional and contemporary perspectives as an essential piece for informing the work of qualitative researchers and readers of qualitative research.

Qualitative research is viewed as credible not because of the research's measurable results but because of the author's efforts to implement valuation and reliability aspects to represent the transparency of the study. It is essential to show the credibility of the research methods in qualitative research. A primary and secondary means to validate the data would give the additional study confidence, building trust with reviewers on the transparency of the final project and any dissertation presented. The foundation of establishing reliability and validity lies in clarifying the assumptions, limitations, and delimitations the researcher provides to the audience, allowing a better understanding of the research context.

Assumptions

According to Creswell and Poth (2018), it is essential to understand the philosophical assumptions that are the basis of qualitative research, with the ability to articulate them into a research study presentable to an audience. This research assumes that businesses need to move quickly to address the change in the business environment due to artificial intelligence and advanced technology. It develops safeguards to protect employees' safety, health, well-being, and work (Howard, 2019). This research assumes that most business leaders today do not have the leadership skills to manage and lead their teams through emerging technology. Human capital is the key to any business. It is essential to reduce the uncertainty that can generate new opportunities for leaders and workers in a future environment with artificial intelligence (Agrawal et al., 2019).

Jackson and Dunn-Jensen (2021) explained that business leaders do not understand the effects of digital transformation on business, and leaders do not have the necessary skills to lead their organization, resulting in lost revenue and business opportunities. The past skills and techniques may apply today, but a different approach may be needed. McCahery et al. (2021) stated that during the coronavirus pandemic, businesses failed in their forced adoption of new technologies at an alarming rate, resulting in lost revenue and business opportunities. It will be assumed that the business leaders associated with the data collection phase of this study were honest and forthcoming in their preparedness to lead, manage, and understand emerging technology. Case study research is qualitative, exploring real-life contemporary systems through detailed data collection involving multiple sources of information, including observations, interviews, audiovisual material, and documentation Creswell and Poth (2018).

Limitations

Communicating limitations in research means speaking to the reader about the potential weaknesses in the study and attempting to provide a frame of reference (Theofanidis & Fountouki, 2018). Case study-based qualitative research limitations include developing the correct sample size, situations out of the researcher's control that limit data collection, or timeframe-restricting methods. Leadership and advanced technology are both broad fields of study that have been extensively written. Henderikx and Stoffers (2022) noted that only some studies have focused on middle managers and their explorative study on the influence of digitalization on middle managers' future leadership skills, behaviors, and management practices. This study aims to look at middle and upper managers to see if their trait skill sets are applicable and conduct a complementary explorative study to examine potential skill-set gaps. Bailey (2022) noted that emerging technology is not just a single changing entity but a dynamic force

that intertwines all aspects of business into a constellation of functions (Bailey, 2022). In association with comments by Baily (2022), business leadership is not a single chasing entity. It must mirror the dynamic force of advanced technology to lead its organizations into the future. The dynamic nature of emerging technology and business leadership creates a potential risk of limiting the study.

Delimitations

The basis of this research is the influence of technology on business leadership, which is a broad topic that requires boundaries to define the scope in a manner that will allow this research to expand on current research. The general problem to be addressed is business leaders' inability to manage advanced technology due to a skills gap, resulting in lost revenue and business opportunities. Further refining this problem to a more specific scope is delimiting precisely to business leaders in Ohio's greater Cleveland metropolitan area manufacturing companies. The content of this qualitative study was limited to interviews, surveys, and observations of business leaders' understanding of the actions and behaviors of the individual leader. The study was delimited by the conscience and unconscious basis of the sample of leaders and limited to manufacturing businesses. Technology change is in many sectors, and the rate of advances could differ based on the industry, defining a complete understanding of the potential problem.

The research determined the driving factors behind the leadership skills gap and whether specific actions exist. Behavior leaders can be more prepared to manage the effects of advanced technology. The more significant problem of the leadership skills gap will be explored, working to define actions and behaviors that can be used to mitigate the effects of unpreparedness in

advanced technology. Providing the assumptions, limitations, and delimitations of this research leads to defining the significance of the study.

Significance of the Study

The research within this flexible design of multiple case studies attempts to find the potential causes concerning business leadership's inability to be prepared to manage emerging technology. The belief is that a leadership skills set gap exists between business leaders managing emerging technology. Digital transformation through advanced technology is rapidly and fundamentally changing business. Organizations that catch this trend will be faster, more flexible, more competitive, and retain market opportunities (Zeike et al., 2019). This study's significance is that it attempts to find the causes of business leadership's inability to be prepared to manage emerging technology. Organizations need help adapting to the leadership scale and skill depth needed to increase organizational productivity, efficiency, employee satisfaction, and stability (McCarthy et al., 2021). This study identifies leadership strategies and styles that contribute to the study, which differed from existing studies on leadership and emerging technology as no research specifically focused on manufacturing companies in Ohio's greater Cleveland metropolitan area.

Additional attributes addressed the leader's preparedness, organizational development training, efficiency in managing new technology, and organizational success through interviews, surveys, and observations of business leaders manufacturing businesses in Ohio's greater Cleveland metropolitan area, collecting qualitative data points. The data collected identified ways companies can prepare leaders by diagnosing their actions and behaviors to prepare them for the future. The next goal will be to discover why a skills gap exists in managing digital

transformation. Lastly, this research highlights organizational success by reducing leaders' skills gap in managing rapid digital change.

Reduction of Gaps in the Literature

The nature of the study was qualitative, with a flexible design and a multiple case study approach with a positivist paradigm. The case studies explored the impact of advanced technologies on business leadership—digital transformation reshaping every aspect of the business world, including the people, processes, and platforms. According to Creswell and Poth (2018), case study research is qualitative, exploring real-life contemporary systems through detailed data collection involving multiple sources of information, including observations, interviews, audiovisual material, and documentation. Reduction of literature gaps is essential to understanding the philosophical assumptions that are the basis of qualitative research with the ability to articulate them into a research study presentable to an audience (Creswell & Poth, 2018). The research conducted addressed the problem of the effects of a gap in leadership skills compared to the rate of technological advance regarded triangulation as a research mindset promoting methodological diversity that will lead to qualitative scientific discoveries. Nielsen et al. (2020) related methodological diversity to the necessary rigor in research to reduce any biases, errors, or limitations that could be experienced in a single data collection form. For this research, two types of triangulations were used: data and theory.

Qualitative research strives for a greater understanding and deep knowledge structure by working with participants, readers, and themselves to obtain detailed meanings to research questions (Creswell & Poth, 2018). There is much research on leadership and emerging technology affecting different business segments. However, there is limited research focusing on the issue of a leadership skills gap affecting manufacturing firms and how it affects a firm's

revenue and future opportunities. Henderikx and Stoffers (2022) wrote an exploratory study on digital transformation and leadership through a small sample size of Google searched content and non-peer-reviewed articles attempting to write on the impact of digital transformation on middle management. However, they found that the current literature was focused on the executive level. Henderikx and Stoffers (2022) recommended that future studies focus on peer-reviewed articles from the defined scientific sources, an expanded data pool, and a greater focus on advanced technology's impact on middle management.

Rossini et al. (2021) wrote about the impact of digital transformation on 19 Italian companies, suggesting that future studies have a different sample size, a different set of researched companies, and in additional countries to explore a more disaggregated categorization of Industry 4.0, leading to the unveiling of further differentiation between companies' digital transformation according to their maturity levels. Another approach was the study by Zeike et al. (2019), which looked at the association between digital leadership skills and well-being among managers. The idea is that a leader's well-being is based on their digital leadership skills, and if a leader is deficient, it will cause stress due to the inability to lead. Zeike et al. (2019) suggested that future studies should examine how improving leadership skills and gaining skill competency will decrease leader stress. Molino et al. (2021) studied technology acceptance based on self-reported data and recommended that future studies include other objective data from peers or supervisors.

This research aimed to bridge the gaps in the literature in the above-referenced articles and potentially identify actions and behaviors that businesses, business leaders, and stakeholders can implement to reduce the leadership skills gap associated with leading and managing through advanced and emerging technology. This research specifically looked at the changes in

leadership due to the changing demands caused by advanced technology and its effects on a leader's ability to lead through these technological changes. Leaders will be confronted with significant challenges and changes due to technology, including strategic transformation processes, system qualification, organizational culture, and the relationship between humans and technology (Peifer et al., 2022). Peifer et al. (2022) noted that leaders need to be shapers of the change process, providing clear objectives and vision, and their personal competencies will be tested due to the changing environment, making it harder to provide clear direction. This study focused more on technologies' impact on middle management and front-line supervisors, the impact based on a manufacturing firm's technology maturity, and how increased leadership skills impact the leader's ability to manage change.

This study addressed the problem of the challenges business leaders face in managing advanced technology due to a skills gap by using multiple data sources, including observations, interviews, audiovisual material, and documentation, leading to methodological rigor to reduce gaps in the researcher's literature. The stated understanding sets the standard for the research process, including the data collection, analysis, and reporting of the study of business leaders in Ohio's greater Cleveland metropolitan area manufacturing businesses. The rigor around the data validation and triangulation with a multi-level approach will build trust with reviewers on the transparency of the research presented. Defining the significance of the study leads to providing the outline of the professional and academic literature related to this study.

Implications for Biblical Integration

Business leaders need to understand the impact of advanced technology on their organizations to be better prepared for the future. “Christians need to join the dialogue and be prepared to carry out our responsibility as we unfold these powerful new technologies”

(Schuurman, 2019, p. 75). For Christian leaders, it is vital to understand the internal and external factors of an organization because responsible management of resources is what drives the opportunity for human resources and promotes the advancement of God's purpose in the world. 2 Corinthians 8:21 states, "For we are taking pains to do what is right, not only in the eyes of the Lord but also in the eyes of man" (*New International Version*, 2011). Keller and Alsdorf (2012) discussed how Christians should use their time, passion, and skills in work environments that help people give and receive love. God has given us all a gift, and as Christian leaders, it is essential to use those gifts to help the world and be an example of God's love and grace.

Emerging technology is changing rapidly and causing anxiety in the business world and through all tiers of employees. However, Philippians 4:6-7 states, "Do not be anxious about anything, but in everything by prayer and supplication with thanksgiving let your requests be known to God. And the peace of God, which surpasses all understanding, will guard your hearts and minds in Christ Jesus" (*New International Version*, 2011). Societal, cultural, and technological changes have continued since the dawn of history, but as Christians is our blessing to continue to have faith in Christ. As business leaders, we would develop an understanding of technology and utilize it to create meaningful jobs and build organizations that advance God's purpose.

As Christian leaders, it is vital to understand the dynamics in an organization caused by emerging technology because the management of our Christ-given responsibilities drives the opportunity to make the world a better place for human resources (i.e., employees) and promotes the advancement of God's purpose in the world. The human populace is being altered by a digital reality morphing into our physical reality, reducing religious faith. The complexity of humans and our complex socio-psychological nature creates a desire to have a certain level of self-worth,

societal status, and contractual and relational expectations (Agrawal et al., 2019). In some respects, this personal self-worth and societal status that used to be associated with one's work is being replaced by data-feeding business intelligence being utilized by autonomous machines in supply chain operations. This change can be a disturbing trend for some people because it reduces the contextual and relational expectations of the world if they do not have a faith baseline. Some non-believers value worldly goods, riches, and experiences, and when that is changed in some fashion, there is a loss of self. Societal, cultural, and technological changes have continued since the dawn of history. Still, Christians are blessed to continue faith in Christ, seeking opportunities to use all technology to strengthen God's purpose.

Benefits to Business Practice and Relationships to the Cognate. This research is relevant to business management as it will provide direction and focus to an organization in establishing the need for training, objectives, and the direction to reach effective organizations. Technological changes have been creating drastic changes in business processes, platforms, and procedures over the past century due to varying levels of technological change. Recent literature identified traits that can help improve leadership skill gaps due to emerging technology. McCahery et al. (2021) referred to a digital workplace landscape where the leader works to leverage technical resources to deliver innovative employee experience and engagement, improving business efficiency and results. The importance of leveraging technology in employee engagement and experience was also echoed by Bailey (2022), who call emerging technology a core component, and everyone, including business leaders, are theorists of technology. If everyone, including business leaders, is a technological theorist', it can be deduced that this is steadily relevant to continue the study of current business relationships. In this context, the leader using technology to focus on the employee resembles a technology-driven version of servant

leadership. Servant leadership is a holistic approach that engages followers on many dimensions, including relational, ethical, emotional, and spiritual levels, allowing the follower to grow (Eva et al., 2019).

The addition of technology changes the platform where the leader engages in their organization. Jackson and Dunn-Jensen (2021) wrote about the importance of ambidexterity as a leadership skill set that is explicitly related to the learning capability of a leader to handle the overarching effects of digital transformation. Ambidexterity as a leadership skill resembles aspects of the adaptive leadership theory, which addresses leadership by providing a framework that the leader can accurately diagnose situations and then adjust behaviors and actions appropriately to meet the current conditions (Ohlsson et al., 2020). Given that the recent literature covering technological adaptation efficacy across multiple disciplines points to a broad spectrum of necessary skills, this study identified specific leadership skills crucial to technology adaptation in midwestern states.

All these changes in business processes, platforms, and procedures will change every aspect of both blue- and white-collar jobs. Recent history has seen the fastest advancement in emerging technology due to the increased functionality of artificial intelligence and the forced adoption of new technologies due to the COVID-19 pandemic. The research intended to give business leaders another perspective on being more prepared to lead through emerging technology and maintain a competitive advantage. To build the ability to influence business leaders, it is essential that the research is fully transparent and demonstrates its validity and reliability.

Summary of Significance of the Study

In summary of the significance of the study, changes in technology have created drastic changes in business processes, platforms, and procedures over the past century due to varying levels of technology. The research intends to give business leaders another perspective on being more prepared to be led through emerging technology and maintain a competitive advantage. Business leaders need to understand the impact of advanced technology on their organizations to be better prepared for the future. The intent of the research continued to provide business leaders with another perspective on how to be more prepared to lead through emerging technology and maintain a competitive advantage. As Christian business leaders, understanding technology is essential to creating meaningful jobs and building organizations that advance God's purpose. Keller and Alsdorf (2012) noted that servanthood is the operating principle of life as we find meaning in our life's endeavors by looking to love God and our neighbors.

Review of the Professional and Academic Literature

The following review of relevant literature addressed the effects of advanced technology on the business sector as emerging technologies are being developed at an accelerated rate, causing a gap in leadership skills. Emerging technology creates a skills set gap where business leaders need to find solutions to managing their current and future workforces, which potentially causes a loss of revenue and business opportunities (Card & Nelson, 2019). Organizations that can move in parallel with technology trends will be faster, more flexible, more competitive, and retain market opportunities (Zeike et al., 2019). In the manufacturing/industrial sector, leadership development is an essential factor in business success. The focus on developing leaders who can think strategically and execute effectively has become increasingly important in recent years as companies have to adapt to rapid technological changes and new competitive pressures.

Common leadership development programs involve classroom training, experiential learning, and mentoring. Classroom training provides a foundation of knowledge and skills, while experiential learning helps leaders apply their new knowledge in real-world situations. Mentoring or on-the-job training can be practical and essential to leadership development, allowing experienced leaders to share their wisdom with neophytes. This review of relevant information investigated current business practices surrounding leadership development in the manufacturing and industrial sectors and the published studies on the success rates of manufacturing businesses implementing enterprise resource planning software. The review of current business practices will lay the foundation to explore further the problem associated with the effects of advanced technology on the business sector through current peer-reviewed articles identifying the prevalence of the problem.

Business Practices

Business practices in leadership development in the manufacturing and industrial sectors vary from firm to firm but are essential for any organization looking to stay ahead of competitors. Leadership development is an organizational practice that has been around for years, where organizations have been looking to select and train current and potential leaders. Leadership development encompasses a variety of processes, practices, and activities designed to improve leaders' knowledge, skills, behaviors, and attitudes so that they may become better equipped to lead their teams effectively.

The development of leaders has been a primary concern, causing organizations of all types to make considerable investments in such programs to prepare their teams for future work (van Tuin et al., 2020). Recently, Gartner Inc. published its *Top five Priorities for HR Leaders in 2023*, where 60% of 800 surveyed human resource leaders across 60 countries rated leader and

manager effectiveness as their number one priority for 2023 (Gartner Inc., 2023). Organizations spend millions of dollars on similar programs to improve a person's individual-based leadership skills (Fatien Diochon & Nizet, 2019). Fatien Diochon and Nizet (2019) noted that most leadership development programs are similar, taking on some form of 360-degree feedback, coaching/mentoring, and focused on a charismatic or transformational leadership approach. This repetitive scope in current business practices excludes the expansion of other general leadership theories or practices that could be better suited for causes a failure to see the assumptions and implications at the cognitive level. Acknowledging that these programs could be more effective, organizations could continue with the same repetitive individual-based leadership skills, achieving minimal results.

Effectiveness in leadership is subjective in that it will differ from organization to organization and person to person. Jiang et al. (2021) noted that the lack of effectiveness in the current business practice of traditional leadership development programs could be related to a gap in the participants' motivation. There needs to be matching motivation by the organization and the participant for any leadership development program to be effective. Many organizations have moved to more cost-effective development options that are more dependent on the initiative of the prospective leader who is self-directed in their development (Jiang et al., 2021). The mindset of the prospective leader is foundational to how leaders process and operate, but mindset development is only seen in 12% of leadership development programs (Gottfredson & Reina, 2021).

Many changes in the global economy affect leader effectiveness with the challenges of digital disruption, and intense global competition requires a new readiness around digital acumen (Mutsuddi & Sinha, 2022). At its core, leadership development in the manufacturing and

industrial sectors should focus on creating an environment where leaders can grow and develop while providing opportunities to practice their skills and abilities. Providing regular feedback and coaching helps leaders understand how they are performing in their roles, as well as what areas need improvement. Additionally, offering development programs such as workshops, seminars, and mentoring sessions is essential to ensure leaders have the resources to succeed.

Various standard business practices exist on leadership development in the manufacturing or industrial sector. For example, according to Fatien Diochon and Nizet (2019), one such practice is leadership development programs (LDPs), which play a crucial role in the success of organizations. They help individuals attain the necessary skills to lead teams and achieve business objectives (Fatien Diochon & Nizet, 2019). However, LDPs are not always sensitive to an organization's unique power dynamics and contexts since they are usually influenced by personal relationships, culture, politics, and hierarchy (Fatien Diochon & Nizet, 2019). When LDPs and coaching programs do not consider power dynamics, they result in ineffectiveness and resistance to the programs.

In addition, most LDPs across organizations look the same because they share the same formalized and centralized structure. This similarity shows neglect of specific contexts in which LDPs are executed (Fatien Diochon & Nizet, 2019). Therefore, it is crucial to explore the power dynamics within the organization to get the meaning of insensitive programs in organizations. After examining these LDPs by monitoring their application in a multinational company in the construction industry for 18 months, aiming to comprehend the insensitivity to organization contexts inherent in the structure of LDPs, Fatien Diochon and Nizet (2019) noted the insensitivity of LDPs to contexts lies in power dynamics where the power strategies instrumentalize contexts in implementing LDPs. Therefore, they called for re-embedding the

study and practice of LDPs into the organization but focusing on those associated with their implementation to widen the scope of their programs based on structures, contexts, and power for improved program effectiveness. Fatien Diochon and Nizet (2019) provided contextual information on leadership development programs and help provide a frame of reference for current leadership development programs.

Most organizations are experimenting with various approaches to enhance leadership development to respond to this. One widely adopted way is the encouragement of self-management, where individuals are encouraged to develop their needs to pursue agility. To ascertain the effects of LDPs on employees' psychological well-being by fulfilling their psychological requirements, van Tuin et al. (2020) conducted a quasi-experimental study. The program, which lasted 8 months, was designed for midlevel team leaders in health systems' customer fulfillment centers. The study showed that leadership inventions that focus on positive psychology and engagement significantly impact employee well-being and organizational results (van Tuin et al., 2020). Creating a leadership program involving employees creates commitment, alignment, and direction. With the current trend of agility and self-management in organizations, LDPs should not be limited to a select group of elite people or management. van Tuin and colleagues (2020) supported the research by examining how psychological needs bring a different perspective.

Another common practice is mentoring programs (Grocutt et al., 2020). They are essential in developing leadership skills in individuals where mentors offer mentees support, advice, and guidance, helping them develop the skills required for effective leadership. According to Grocutt et al. (2020), a good mentoring relationship involves support in various ways, such as mentors helping mentees achieve their goals, providing constructive feedback,

enhancing their listening skills, and shaping their behaviors. Mentors and mentees should communicate openly and honestly, be willing to develop and be committed (Grocutt et al., 2020). Also, effective mentorship programs require established mentee and mentor roles, with mentors having more leadership experience than mentees (Grocutt et al., 2020). Mentoring programs are essential in developing leadership since they enhance the development of leadership competencies, increasing organizational commitment and affective well-being (Grocutt et al., 2020). As a result, organizations and institutions can use them to nurture leadership development. Grocutt et al. (2020) brought the perspective of mentoring into leadership development, potentially providing additional context to businesses leading in the age of advanced technology.

Group coaching is another common and valuable practice in a business leadership development program (Mbokota & Reid, 2022). It helps participants develop key leadership competencies and build a supportive network of peers (Mbokota & Reid, 2022). It also offers a safe and supportive environment where participants reflect on leadership behaviors and styles and receive peer feedback, helping them understand their strengths, weaknesses, and blindspots, which is essential for effective leadership (Mbokota & Reid, 2022). Group coaching is crucial to improving employees' skills, motivation, and performance to effect transformational change (Mbokota & Reid, 2022). It also plays an essential role in developing personal competence, self-confidence, and self-awareness, increasing the ability to empower others and creating a safe working environment where people learn through the input and support gained from others (Mbokota & Reid, 2022). Mbokota and Reid (2022) provided another perspective on the importance of coaching in leadership development.

Digital acumen in information technology is another common practice required to develop leadership skills (Mutsuddi & Sinha, 2022). In today's digital era, organizations need employees with technical expertise and strong leadership skills to navigate complex technical environments and drive innovation (Mutsuddi & Sinha, 2022). Since there is not much information available on the role of human resource (HR) professionals in the contemporary digital era, attempts have been made to determine the role of leadership skills in developing digital acumen in employees working in information technology (IT) organizations. A study by Mutsuddi and Sinha (2022) indicated that employees' perception of acquiring digital acumen was influenced by factors championing leadership, such as teamwork, ambiguity tolerance, collaboration, and adaptability. They also noted that the necessary leadership abilities required for digital transformation could be facilitated by sharpening progressive thinking, taking risks, and having the ability to solve problems (Mutsuddi & Sinha, 2022). Mutsuddi and Sinha (2022) directly support the current research by defining the current state of leadership development.

Technology Implementation in Manufacturing Businesses

Manufacturing businesses are struggling to keep up with the ever-changing technology landscape. New technologies are emerging daily, and it can be difficult for these businesses to stay ahead of the curve and remain competitive. The terms frequently used in business and academia to refer to advanced manufacturing are intelligent manufacturing and Industry 4.0, known as the fourth industrial revolution. This fourth industrial revolution describes an organization's technological and organizational transformation, fully automating and digitizing all physical assets and integrating cooperating systems (Kwiotkowska et al., 2021). Without digital transformation and proper technology implementation, manufacturing businesses risk falling behind competitors who have adopted more advanced production solutions. The lack of

decision to move to advanced manufacturing solutions could decrease productivity and efficiency, resulting in higher costs and lower profits.

At the core of Industry 4.0 is a focus on connectivity and automation, which enables machines to communicate with each other and make decisions without human intervention. Improvement in production accuracy led to faster throughputs in factories across multiple industries. Additionally, the data collected by these systems has made it possible for businesses to gain valuable insights into their operations and make informed decisions about improving them. This examination is of two main areas that manufacturing businesses deal with in digital transformation. The first is the automation of manufacturing equipment design, or advanced manufacturing, which improves shop floor performance efficiency and enterprise resource planning (ERP) systems. Shop floor performance efficiency is achieved through robotics and automation of existing processes that either eliminate labor or improve labor efficiency, increasing output (Stornelli et al., 2021).

Governments have supported manufacturing efficiencies for two reasons: to give their countries a competitive advantage in the global economy, gain growth, or align with defined political agendas. Stornelli et al. (2021) noted that the American government has invested over two billion dollars in advanced manufacturing initiatives since 2012. The European Factories of the Future Association (EFFRA) issued a roadmap to reduce energy consumption by 25%, which aligned with climate goals outlined by the European Union (Stornelli et al., 2021).

Advanced Manufacturing Technologies. Manufacturing has transformed in recent years due to the accelerated development of technology and automation. Traditional manufacturing was stand-alone segregated systems that lacked automated monitoring and control capabilities (Kalsoom et al., 2020). Technologies identified as advanced manufacturing

technologies are broad applications that include robotics, 3D printing, and AI-powered analytics software, which have all been adopted by companies seeking to modernize their production processes and improve efficiency (Kalsoom et al., 2020). Companies must invest in the right technologies and create an efficient data-driven production system to use advanced manufacturing technologies.

Zhou et al. (2022) conducted a literature review on intelligent manufacturing production and operations management with key features including connectivity, optimization, transparency, predictive, and agility. In order to take advantage of advanced manufacturing technologies' potential, companies need to invest in the right technologies and create an efficient data-driven production system. The initial investment can be concerning due to economic barriers in start-up costs. Zhou et al. (2022) referred to a study by Capgemini Consulting, which believes intelligent manufacturing could add $500 billion to $1.5 trillion in value to the global economy in the next 5 years, accelerating on-time delivery of finished products and significantly improving product quality.

Stornelli et al. (2021) noted several economic concerns, including the sunk cost of system adaptation, high costs of machines, liquidity constraints, training costs, and information technology costs (IT). Businesses are investing in AI-powered analytics, developing a secure IoT infrastructure, and automating manual processes through robotic process automation (RPA). The business aims to make the most of advanced manufacturing, be part of Industry 4.0, and benefit from its many advantages**.** Potentially, that would have a considerable impact on the global economy. However, things are left to understand: the investment needed to drive economic gain, the business leadership needed to handle technology implementation and organizational transformation, and the effects on human jobs.

Manufacturing scale is another consideration companies need to consider when considering advanced manufacturing technology investment. Gong et al. (2022) noted that robotics in smart factories have the best return on investment on large-scale operations due to the high cost and time of machine robotic setup time. In smaller and medium-sized firms, humans can efficiently perform conversion and production for smaller, more complex parts at a lower setup cost. Setup costs and time can be reduced for small and medium firms with robotics, but that would come with more investment, and that additional cost can be a detriment and require a more specialized workforce (Gong et al., 2022). However, as machine setup gets more complex, workers must have a greater understanding of data science skills applicable to manufacturing. According to a Deloitte Manufacturing Institute study, Li et al. (2021) suggested that an estimated 2.4 million manufacturing job posts will go unfilled by 2028, and industries entering a prolonged long-term labor shortage resulting in a $2.5 trillion negative impact on the U.S. economy. The benefit of advanced technology shows a revenue advantage, yet the lack of skilled workers raises concerns about how businesses will handle potential staffing concerns.

Efficiency can be gained by investing in AI-powered analytics, developing a secure Internet of things (IoT) infrastructure, and automating manual processes through robotic process automation (RPA). By doing so, businesses can make the most of advanced manufacturing and benefit from the trend of Industry 4.0. The complete understanding of the effects of advanced manufacturing technologies and this technological revolution is diverse at best (Ballestar et al., 2021). Ballestar et al. (2021) continue that in 2019, the estimate was that robots would eliminate 14% of jobs and another 35% would be seriously affected by automation. For example, in advanced manufacturing, robotics are generally divided into three main categories affecting human jobs: material handling devices, which function as collaborative robots with humans or

act autonomously (Vaisi, 2022). Still, a greater understanding of how business leaders must adapt to these technological solutions is needed.

ERP System Success and Implementation Success. The success rate of enterprise resource planning (ERP) implementations in manufacturing businesses has been a topic of interest for many researchers. In recent years, implementing ERP systems has become increasingly important for organizations looking to optimize operations and remain competitive in the global economy. In the current competitive business environment, ERP implementations have become essential for manufacturing businesses looking to optimize their operations and remain profitable. ERP is vital in streamlining business operations and providing a comprehensive view of corporate data (Malik & Khan, 2020). It supports various activities using application software encompassing different modules that help organizations achieve their organizational goals effectively and efficiently. Implementing ERP programs improves business performance, fosters growth, serves customers better and reduces working capital (Mahmood et al., 2019). However, despite the potential benefits of ERP systems, organizations are usually faced with issues and challenges when using and implementing them (Mahmood et al., 2019). Although many success stories have been published recently on the success of ERP systems in organizations, the failure rate is relatively high. Mahmood et al. (2019) conducted a study to assess the criticality of the challenges organizations face when implementing ERP programs. They identified 31 challenges critical to organizations, most of which are ERP-related, confirming the theory that although ERPs are helpful in organizations, they also have potential risks that can harm the organization if they are not mitigated effectively by business leadership. Implementing ERPs requires a change in the business processes, socio-technical aspects, and

employees' mindsets. Mahmood et al. (2019) supported the current research by showing that there is a high failure rate when implementing enterprise resource planning in businesses.

ERP projects encourage robust organizational change by allowing the entrance of new information to bring new updates to organizational processes (Malik & Khan, 2020). All of which need business leaders to have the skill sets to manage these changes. These projects offer a competitive advantage by enabling innovative business strategies that add more operational control and visibility. After exploring these ERPs in developing countries, Malik and Khan (2020) recommended that leadership choose the appropriate timing to implement ERP, then select the right ERP package and the right choice of vendor to implement that package. Malik and Khan (2020) provided evidence of many ERP project implementation failures, supporting the current research as evidence that leaders are unprepared to implement advanced technology.

The rapid technological changes, employers find it difficult to get skilled workers with the required technical and higher-order thinking skills to perform effectively in their jobs. Considering skill gap reduction, it is essential to understand the role of technology and higher-order thinking skills and how they go hand in hand. Technology has become crucial in almost all aspects of modern life, including workplaces (Qiu et al., 2020). Therefore, employees must possess the right technical skills to utilize technology effectively. They should be proficient in using various software applications, operating systems, and programming languages (Qiu et al., 2020). Employers must ensure that employees are trained to keep up with technological advancements. However, it is essential to note that technical skills alone are insufficient (Qiu et al., 2020). High order thinking skills such as creativity, problem-solving, and critical thinking are essential (Qiu et al., 2020). As employers emphasize technical skills, they should also focus on

high-order skills because employees will become more effective and make better decisions, increasing productivity and positively impacting organizations and employees.

Successful implementations have been those with clear goals before implementation, adequate IT infrastructure, and a strong commitment from management. While ERP implementations can be complex and time-consuming, the benefits to a business are clear. With the proper preparation and commitment from the organization, ERP implementations can provide actual cost savings and improved efficiency in manufacturing businesses. Organizations should thoroughly prepare for the implementation process to ensure success, with a clear focus on their project goals and an appropriate IT infrastructure and management commitment. With an optimal implementation process and the right organizational commitment, ERP implementations can provide actual cost savings and efficiency improvements in manufacturing businesses. Organizations can maximize the chances of successful implementation by understanding ERP implementations' advantages and potential pitfalls. With the proper preparation and commitment from the organization, ERP implementations can provide actual cost savings and improved efficiency in manufacturing businesses.

Additionally, successful implementation requires adequate preparation on the part of the organization, with clear goals and an established IT infrastructure. With the right combination of preparation, commitment, and dedication, organizations can maximize their chances of a successful ERP implementation and unlock the potential of their operations. By understanding the advantages and potential pitfalls of ERP implementations, organizations can maximize the chances of success while ensuring they gain all the benefits associated with an optimal implementation.

The Problem

The general problem to be addressed is business leaders' inability to manage advanced technology due to a skills gap, resulting in lost revenue and business opportunities. According to Card and Nelson (2019), emerging technology creates a skill set gap where business executives need to find solutions on how to manage their current and future workforces, which causes a loss of revenue and business opportunities. Jackson and Dunn-Jensen (2021) explained that business leaders need to understand the effects of digital transformation on business. Leaders do not have the necessary skills to lead their organization, resulting in lost revenue and business opportunities. McCahery et al. (2021) stated that during the coronavirus pandemic, businesses failed in their forced adoption of new technologies at an alarming rate, resulting in lost revenue and business opportunities. Henderikx and Stoffers (2022) stated that organizations have focused on strategic leadership to lead a digital transformation. Still, there is a lack of information on the skills needed during and post-digital transformation of an organization. The specific problem addressed is the gap in business leaders' potential technology skills between managing manufacturing companies in Ohio's greater Cleveland metropolitan area, resulting in lost revenue and business opportunities.

Leader's Inability to Lead

Implementing advanced technology in the workplace has been a complex challenge for many business leaders. Unfortunately, many organizations have struggled to manage new technology properly due to a skills gap between employers and employees. The skills gap refers to the mismatch in abilities between employers' expectations and employees' qualifications, most often related to technical proficiency or knowledge regarding technology. Leaders have struggled

to bridge this gap to ensure that their organizations properly utilize the advanced technology they have invested in.

Fortunately, there are several approaches businesses can take to address this challenge. For example, many organizations have taken advantage of upskilling initiatives or professional development opportunities for current employees. This training helps employees learn the skills needed to manage and use advanced technologies, allowing them to make the most out of their organizations' investments. In addition, companies may also investigate hiring new talent with the skills that are necessary for effective management. By doing so, leaders can ensure that their teams have the knowledge to handle any advanced technology their organizations use correctly.

Ultimately, the success of any company's implementation of advanced technologies relies heavily on the skill level of its employees. Leaders must identify and close gaps in their teams' skill sets to ensure that new systems are appropriately utilized. Through upskilling initiatives, professional development opportunities, and strategic hiring decisions, leaders can bridge the skills gap and make sure their organizations take full advantage of advanced technology. By following these steps, business leaders will be better prepared to manage any new technologies they introduce in the workplace. With a skilled team, they will have all the tools they need to ensure their organizations make the most out of their investments in advanced technology.

Bailey (2022) examined how technological advancements are occurring rapidly and unpredictably, with a broad scope, enabling new interdependencies within and across units and players that many organizations have thought to be outside their control. Using relational thinking from sociology and philosophy, the authors developed a relational perspective on emerging technologies to conceptualize the connection between organizing and emerging

technologies. Bailey (2022) aimed to provide organizational scholars with a fresh approach to theorizing about critical organizational processes and phenomena that take into account technology's ever-growing influence. Bailey (2022) presented a unique approach for organizational scholars to account for the influence of technology in their areas of interest by proposing a relational paradigm that regards emerging technologies not as stable entities but as a set of evolving relations. Therefore, Bailey (2022) supported this study by providing evidence to support the problem statement that technology is changing the manufacturing sector of the business.

According to Card and Nelson (2019), businesses must find innovative ways to upskill workers to meet future demands. The researchers conducted the study to show how corporate leaders' incapacity to manage new technologies owing to skill gaps leads to lost revenue and business opportunities (Card & Nelson, 2019). They assess the U.S. unemployment rate, which is at a 50-year low, and the rising use of automation predicted to compel businesses to replace or retrain more than 25% of their staff. In their results, Card and Nelson (2019) discovered that companies that aim to integrate the best aspects of human intellect, empathy, and change resilience with the responsible use of automation and reskill would be at the forefront of the future workforce. Card and Nelson (2019) demonstrated the issue that managers of new technology may not have the necessary abilities.

The responsibilities placed on managers are fundamentally shifting as the workplace becomes more digitalized, to the point where a new area of study called "digital leadership" is beginning to take shape. Claassen et al. (2021) conducted a study to develop and test a standardized instrument for measuring digital leadership. The goal of the tool's creators was to make it the first to start a further scientific discussion on digital leadership by incorporating the

employees' point of view. Claassen et al. (2021) noted that the instrument designed to assess digital leadership performs well in evaluating discriminatory power, one-dimensionality, homogeneity, reliability, and construct validity. It intends to stimulate additional investigation and scientific dialogue on health-oriented leadership within the 4.0 work environment. Thus, Claassen et al. (2021) supported this research problem by noting it and looking for solutions.

As more manufacturing organizations strive to integrate digital technology, the difficulties of digital transformation (DT) have come under scrutiny. A study by Favoretto et al. (2022) explored the challenges faced by DT in manufacturing firms to suggest new research possibilities. An organized perspective on organizational commitment, value creation, value proposition, value delivery, value capture, information and technology infrastructure, and data security was found (Favoretto et al., 2022). The researchers also suggested a conceptual framework to promote more thorough investigations and direct managerial choices about an integrative understanding of DT (Favoretto et al., 2022). They directly supported the research by discussing value proposition and creation and how these factors will affect future business prospects and income for manufacturing companies.

Heckscher (2021) argued that the sociological point of view strongly emphasizes the leadership setting. Heckscher (2021) indicated that leadership has recently changed significantly as firms have switched from bureaucratic to collaborative organizational structures, increasing the demands on leaders. Additionally, Heckscher (2021) pointed out that while there are limited instances of this leadership transformation in businesses, they are strong indicators of the importance of essential qualities, including the capacity to create and oversee engagement procedures over time and facilitation skills. Heckscher (2021) supported the research by

examining parts of collaborative leadership structures that can better equip leaders to lead in the age of developing technology.

Digitalization has significantly impacted how businesses engage with customers and do business. In their study, Kretschmer and Khashabi (2020) indicated that organizations' extensive adoption of digital technology has resulted in a profound shift that could impact many businesses' internal operations and procedures. By categorizing and examining the impact on the method of output generation in organizations, the researchers create a comprehensive picture of how the digital revolution influences organizational design. Based on this illustration, Kretschmer and Khashabi (2020) developed and elaborated on the potential advantages and disadvantages of the digital transition for businesses, which also correlates to leadership and technology issues in the current research.

Manufacturing companies are evolving toward digital servitization to take advantage of the possibilities of digitization. Kolagar et al. (2022) sought to analyze how manufacturing companies that engage in digital servitization modify their ecosystems. Kolagar et al. (2022) aimed to clarify the uncertainties associated with implementing the ecosystem transformation concept in digital servitization. Kolagar and colleagues (2022) showed that ecosystem transformation processes depend on various variables, impacting how management should lay the foundation for digital servitization. In light of this, Kolagar et al. (2022) contended that it is crucial to comprehend the forces, controls, and motives that push enterprises to pursue ecosystem transformation. In terms of digital servitization, this will act as a micro-foundation for strategic decision-making. Kolagar and colleagues (2022) supported the research by discussing the changes in business models that firms must adapt to stay relevant in today's economy.

Sousa-Zomer et al. (2020) conceptualized and explored the significant antecedents of an essential capability for digital transformation and its effect on the competitive advantage of enterprises by drawing on the literature on dynamic capabilities and digital transformation. Digital savvy skills, digital intensity, and context for action and interaction are the three main micro-foundations identified in the study that, when combined, help to build a digital transforming capability (Sousa-Zomer et al., 2020). Sousa-Zomer et al. (2020) supported the research by advancing the understanding of the digital transformation phenomenon and revealing the role of the primary components underlying the digital transformation capability.

Research also demonstrates how emerging dynamic technologies are reshaping the human resource management (HRM) landscape on a global scale. Vrontis et al. (2022) examined the effects of artificial intelligence and the lack of a thorough grasp of deploying these technologies in HRM at an organizational and individual employee level. The findings demonstrate that intelligent automation technologies provide a new method of managing personnel and boosting business performance, providing HRM with several benefits but also significant obstacles on the technical and ethical fronts (Vrontis et al., 2022). The impact of these technologies was noted to focus on HRM strategies such as recruiting, training, job performance, learning opportunities, decision-making, AI collaboration, and job replacement. Vrontis et al. (2022) supported the study research as it looks at the impact technology has on businesses, which will need to be known by business leaders to develop the skills required for adapting to emerging technology.

Concepts

Skills-Set Gap Exists Between Business Leaders in Managing Emerging Technology. In recent years, automation and artificial intelligence technologies has advanced rapidly, a

significant source of concern due to their potential to disrupt labor markets significantly (Agrawal et al., 2019). While AI may enhance productivity, it is also fueling concerns about mass technological unemployment and a renewed desire for policy initiatives to deal with the effects of technological transformation. Agrawal et al. (2019) pointed out that human resource workflow is divided into many prediction tasks so that machine learning software can handle them. The researchers evaluate several ways that advances in prediction technology powered by AI affect labor in a task-based framework. This indicates how some professions, like demand forecasting, have been transformed into prediction tasks, and AI increasingly replaces those who fill the job descriptions.

Additionally, Agrawal et al. (2019) posited that complementary decision tasks can be fully automated when automated prediction raises relative returns to capital against labor in those tasks. In some circumstances, the authors also conclude that automating prediction tasks may not affect the productivity of capital executing a complementary task but may boost labor productivity (Agrawal et al., 2019). Another way that artificial intelligence directly affects labor is when automated prediction sufficiently reduces uncertainty to allow previously unimaginable decision-making activities to occur. The rapid pace of evolving technologies necessitates innovative management techniques, and modern executives must consider what incentives they could employ to inspire their workforce during uncertain times. Agrawal and colleagues (2019) supported the research by highlighting the impact of emerging technology on job decisions.

In today's unstable business environment, businesses must be exceedingly creative to thrive. Focusing on employees' creativity is essential for companies to improve organizational competitiveness and cope with the dynamic environment. A study by Ilyana and Sholihin (2021) examined whether the nature of incentives provided and leadership styles combined affect

creative performance in organizations. The study aimed to contrast competition-based monetary and non-monetary incentives to determine which strategy generates the most innovative ideas and explain how various leadership styles impact creative output. The findings revealed no significant difference in the effectiveness of recognition incentives and tournament rewards in influencing creative performance (Ilyana & Sholihin, 2021). In addition, an empowering leadership style has the potential to promote greater creativity. The rapid pace of evolving technologies would necessitate innovative management techniques. This study affects the current research by showing that the speed of emerging technology would require creative means to manage effectively and also what incentives modern leaders can use to motivate their organization in times of uncertainty.

Digitalization and technological development have significantly impacted how people work and live, businesses operate, and governments make policy decisions. Education and training are crucial for providing the existing and future workforce with appropriate skills for the digital economy. Loucks and Ozogul (2020) evaluated an instructional technique that allows students to engage in virtual teams and practice virtual leadership skills in an actual context, preparing them for these responsibilities in the workplace. The study's primary objectives were to determine how the cascade method is implemented when teaching virtual leadership in an undergraduate course and to record how instructors and students felt about the strategy. Students will be better equipped for virtual teams and virtual leadership roles in the workplace if they can develop virtual leadership abilities in an authentic context during their undergraduate program (Loucks & Ozogul, 2020). The study's findings also emphasized the value of planning, technology management, communication, regulating student attitudes, and coaching when utilizing this technique to teach virtual leadership and virtual team skills (Loucks & Ozogul,

2020). The article affirms a skill gap among students entering the workforce due to technological advancements and business gaps.

The sharing economy is frequently seen as disruptive to businesses, operational procedures, market segments, and industry sectors. According to Abhishek et al. (2021), peer-to-peer (P2P) rental markets are a component of the broader sharing economy. In their research, the authors examined how different market configurations affect how a P2P rental market interacts with a producer of durable goods. Abhishek et al.'s (2021) key objective was to comprehend how a P2P platform affects the market, looking into the circumstances in which a monopolistic manufacturer (OEM) and the consumers benefit from or lose out due to the P2P rental market. The study's findings showed that the sharing economy significantly alters how markets are structured, forming a new class of resource allocation systems and enabling enterprises to operate beyond their capacity (Abhishek et al., 2021). This two-fold transition has offered unprecedented efficiency in implementing the coordination aspect of pooling talent and resources. Thus, Abhishek et al. (2021) provided new perspectives that have significant implications for OEMs, such as how and when to choose between various business models across multiple markets with varying degrees of heterogeneity, thereby supporting the current research by identifying a disruptive technology.

The COVID-19 epidemic has compelled many enterprises to implement significant adjustments in their business practices and human resource management. Seaton et al. (2021) show how the COVID-19 pandemic has spurred substantive change in how businesses are now operating and introducing new ideas regarding culture, practices, and behaviors moving forward. Seaton et al. (2021) argued that the pandemic has allowed non-evidenced ideas to increase in management practices. As a result, Seaton et al. (2021) advised practitioners against

implementing exciting new techniques or measures of constructs that may appear unique on the surface when dealing with recent organizational changes brought on by the external environment. Also, Seaton et al. (2021) advised practitioners to review current procedures to determine how to resolve current issues, which entails viewing the need for change from a much more comprehensive perspective rather than as individual topics for research or creating and implementing new practices. Seaton et al. (2021) connected to the current investigation by examining the post-COVID-19 world's required leadership qualities and how remote work is affected by technological adaption.

Identifying Emerging Technology is Dependent on Leader Preparedness. Bendig et al. (2022) looked at the presence of technology leadership as chief information officers in organizations. Bendig et al. (2022) sought to expand academic awareness of the root causes of driving innovation in the guise of the IT chief at the highest management level. Bendig et al. (2022) strengthened the idea that IT governance can result in organizational changes by defining the underpinnings of digital innovation in the C-suite and explaining how environmental, systemic, and consequential variables can function like forebears. Bendig et al. (2022) also enhanced the existing research on information management and strategic planning. Therefore, Bendig et al. (2022) supported the study by highlighting the need for a dedicated leadership person within an organization to monitor emerging technology in that business sector. It derives a comprehensive model from the literary works on innovation capability, incorporates the idea of adaptive capacity pressures, and contends that both inside and outside information technology-related factors, including ecologic, systemic, and strategic aspects, increase the pressure on an organization to transform. Bendig et al. (2022) supported the research by highlighting the need

for a dedicated leadership person within an organization to monitor emerging technology in that business sector.

Cantú-Ortiz et al. (2020) presented a strategy for a state-of-the-art review of artificial intelligence in education and a case study about preparing students to have the competencies and skills necessary for the current and future digital transformation to Industry 4.0. Cantú-Ortiz et al. (2020) supported the current research by discussing the competencies and skills required for current and future digital transformation to Industry 4.0. Its objective is to assist higher learning institutions in developing teaching methods that facilitate the growth of businesses by equipping them with competent human capital to cope with the difficulties facing the 21st century, which have led to the professional workplace now known as the Fourth Industrial Revolution. To prepare professionals for the upcoming corporation, the method consisted of an advanced analytics assessment of AI trends and issues relevant to academia, concentrating on sophisticated human-computer language and participatory engineering and production. Cantú-Ortiz et al. (2020) also included a case study that draws on Tecnologico de Monterrey's 35 years of delivering scholarly AI technology to train prospective engineers and domain experts. Graduate and undergraduate programs, research, apprenticeships, innovations, globalization projects, and entrepreneurship are among the elements of the case study in Cantú-Ortiz et al.'s (2020) study. As a result, the method and case study offered may serve as helpful manuals for other institutions of higher learning, putting academic AI systems in place to prepare learners needed by 21st-century businesses. Cantú-Ortiz et al. (2020) supported the research by discussing the competencies and skills required for current and future digital transformation to Industry 4.0.

Adopting and integrating digital technology in organizations is crucial for communication, administration, and management and is a significant asset in supporting

learning, teaching, and organizational change. Ifenthaler and Egloffstein (2019) stated that leadership preparedness is improved when leaders understand and utilize the maturity model to understand digital transformation. Ifenthaler and Egloffstein (2019) claimed that current educational software acceptance and integration models mainly concentrate on classroom environments and personal differences, elucidating incorporation dynamics. Ifenthaler and Egloffstein (2019) addressed the discrepancy in a comprehensive digitalization model in education institutions by creating a set of best practices with theoretical foundations. The research used 222 personnel in two rounds of data collecting for a case study. The results showed that the corporation in question had a favorable attitude toward information technology and digital technology. Ultimately, the results indicated that the creation of maturity models should be incredibly transparent and adhere to a precise process. Model evaluation and verification ought to be conducted before transferring and extrapolation. Also, it is crucial to evaluate the influences that individual motivations, dispositions, and organizational perspectives should have on digital innovation and operational commitment. So, Ifenthaler and Egloffstein (2019) concluded that administrative and institutional resource enhancement should go hand in hand with effective communication strategies for successful digital uptake procedures.

Li et al. (2021) looked at Industry 4.0 and how it is changing the labor market structure and the demand for prospective workforce skills, not that identifying gaps in critical skills and domain knowledge is essential for the digital transformation of manufacturing. Li et al. (2021) supported the research by acknowledging that identifying gaps in organizational structure can help an organization prepare to deal with emerging technology. Insights on the developments in industrial output that use computer science, automation, cyberspace, and sensing technologies are provided. Instructors and businesses will find these ideas helpful in developing the future

industrial workforce. Li et al. (2021) claimed that modern production personnel are not only required to be proficient in conventional manufacturing techniques but must also receive training in cutting-edge computer-automated data-rich technologies. Li et al. (2021) provided a presentation of the general pattern in production job advertisements in the United States, a summary of the critical competencies and specialized knowledge in consumption in the manufacturing industry, an overview of the skill sets and technical requirements disclosed by production job applicants, the identification of the gaps amid supply and demand for competences and conceptual understanding, and the identification of opportunities for workforce development and upskilling to resolve the broadening skills mismatch.

Veile et al. (2020) provided better insights into understanding relevant implementation action for technologies related to Industry 4.0. Veile et al. (2020) brought an additional perspective on the skills needed and lack thereof in leading through emerging technology in business. Veile et al. (2020) investigated six important production system components and their sub-dimensions of alterations to propose a process to assess how easily an existing industrial system may be transformed into an Industry 4.0 unit. Therefore, a theory-based graph operation is suggested for estimating the sustainability strategies index and its comparative and lower limit value systems. This technique relies on professional judgment on cooperation and the implications of the transition of one constituent on the transition of others about the study's findings. Veile et al. (2020) then discussed the integration of strategic flexibility into manufacturing technologies. Veile et al. (2020) suggested a straightforward method for computing TI's idealized, comparative, and borderline values to determine whether any control function could be upgraded to the INDUSTRY 4.0 technology. Consequently, the suggested approach for calculating the TI, comparative sustainability strategies index (RTI), and associated

threshold values could be helpful for decision-makers to determine if the industrial manufacturing equipment and its components were suitable for modernization or should be scrapped.

Coronavirus Forced Adaption of New Technologies. The COVID-19 pandemic exposed the complexity of our world and the importance of effective leadership and followership in navigating the complexity. In such a complex world, leaders must be able to adapt quickly to changing circumstances and make decisions based on incomplete or uncertain information (Uhl-Bien, 2021). They must think creatively and critically while collaborating with other stakeholders to find innovative solutions to complex problems. They must also communicate effectively and build trust with their peers to promote transparency. Followership is also critical in a complex world. Followers must also be flexible enough to adapt to complex situations and provide the necessary inputs to help their leaders make informed decisions. During the pandemic, effective leadership and followership were essential in managing the complexity and urgency of the situation (Uhl-Bien, 2021). Leaders had to make difficult decisions about balancing social, health, and economic concerns. They had to collaborate with other leaders to formulate strategies that responded to the situation. Working collaboratively is essential in creating a conducive working environment with mutual respect and distinct roles.

Digital transformation is a complex process requiring strong leadership to make it successful. Effective digital transformation combines visionary thinking, collaboration, agility, customer focus, technology savvy, change management skills, and a strategic mindset (McCarthy et al., 2021). By cultivating such characteristics, leaders can head successful digital transformation programs and ensure that their organizations remain competitive in the digital age. The process has developed so much curiosity and research, especially after the COVID-19

pandemic, that it accelerated its pace in almost all sectors. Current research does not fully understand Digital Transformation Leadership (DTL). McCarthy et al. (2021) conducted a study through a systematic procedure that involved coding and identifying 87 research materials, resulting in around 600 coded excerpts. The study analyzed several DTL characteristics to raise awareness, especially among leaders. These characteristics are essential in helping organizations succeed in digital transformation programs (McCarthy et al., 2021).

The COVID-19 pandemic shook the world and created an unprecedented global situation full of uncertainties. The pandemic exposed many defects in many areas, including social media, where Big Tech became a significant source of misinformation that needed more regulatory strategies (McCahery et al., 2021). Many sources argued that mainstream media was crucial in triggering policy responses such as lockdowns, containment, and social distancing (McCahery et al., 2021). New things came up, such as working from home, decreased pollution levels, and reduced harmful behaviors that affected the environment. The long-term effects of the pandemic are unpredictable, but it would be correct to conclude that returning to the ‘old ways’ is highly unlikely (McCahery et al., 2021). The pandemic created a historical chance where regulatory approaches in many facets were exposed, and other models were introduced to mitigate changes. Now that the pandemic has occurred, people should anticipate a more socially, better, and environmentally cautious future. However, people must distinguish between reliable and unreliable information to avoid confusion and unmediated information.

Self-awareness plays an essential role in leadership and personal growth. During tough times, self-awareness becomes even more critical for leaders to navigate challenges effectively. To cultivate self-awareness, leaders must engage in various practices such as mindfulness, feedback seeking, and reflection (Yeo, 2021). Leadership can be seen as human anatomy, where

people must connect to the core of who they are to be effective and make informed decisions. Our body parts have the sensory powers to connect with the inside and outside worlds. For instance, the head acts as the logic sensor with the ability to view sequences and connections, while the heart is the sensor that feels and sympathizes (Yeo, 2021). Developing leadership resilience comes from within, whereby a leader's performance will result from different variations in internal responses due to external pressure. Leaders can better understand themselves and their impact on others by making decisions based on internal triggers (Yeo, 2021). Yeo (2021) described how leaders behave and react in unprecedented times when a professional service firm has been severely affected by the COVID-19 pandemic. They supported the research by providing additional support on the changes that the COVID-19 pandemic caused in the business world.

COVID-19 has brought many changes to workplaces all over the world. It disrupted the standard working ways in all institutions, including businesses, health, and education. These changes affected the worker's job satisfaction and motivation (Aslam et al., 2022). Challenges and suffering reduce employee motivation, productivity, and happiness. Employees need motivation to perform well and create a healthy organizational culture. Leaders must develop new leadership styles to harness uncertainty and improve employee job satisfaction and motivation. The pandemic affected many organizations and governments globally, leading to a crisis that affected leaders and followers in societies (Aslam et al., 2022). Organizational leaders had to frame employees' experiences during and after the pandemic and help them adapt to the new realities. To date, the communication levels of those in leadership still affect followership behavior, mental health, and performance. Since the COVID-19 pandemic, the global economy has been experiencing the "new normal" because many countries have never recovered (Aslam

et al., 2022). Many organizations moved from the public domain to private spaces, changing the differential learning and responsibility.

The effects of coronavirus COVID-19 are unprecedented. From an organizational point of view, the crisis was a disruption, a complex and ambiguous event that caught leaders off guard. The crisis was human nature, and human resources (HR) was central in taking organizations through and exiting successfully (Collings et al., 2021). The pandemic posed challenges to HR leaders, and mapping an exit route was one of their essential functions. It created an unprecedented chance for HR roles to increase and influence the urgent need for urgent responses. These leaders had to balance the pandemic and the organization's long-term and short-term objectives (Collings et al., 2021). The crisis mounted pressure on leadership teams, and prolonged presence caused employees anxiety and stress. HR leaders were automatically placed in a situation that exposed their abilities to deal with challenges. Some organizations made it through, while some collapsed. Others encouraged their employees to work from home, while others had to close temporarily. It is important to note that any critical decision depends on HR leaders and their ability to make strategic decisions.

Theories

Transformational Leadership. In today's global business environment, companies and organizations face many uncertainties that necessitate solid and effective leadership. Many researchers contend that transformational leadership is one of the leadership styles that can drive this change, and it can be achieved by appropriate training and cultivating effective information technology. Cohrs et al. (2020) researched to develop and evaluate a leadership development program focusing on transformational leadership and communication. In particular, the researchers attempted to validate previous findings about the trainability of communication skills

and transformative leadership. Cohrs et al. (2020) results indicated that feedback considerably enhances leadership and communication abilities, further supporting the case for using feedback in training programs. Cohrs et al. (2020) offered practical information on how to construct transformational leadership intervention, which supports the current research by emphasizing how it should be applied in tandem with developing technologies.

According to Kim et al. (2021), one of the key elements influencing organizational development is unethical pro-organizational behavior (UPB). UPBs are deliberate actions taken by individuals that support or enable members of a society to function productively while transgressing the society's essential beliefs, ethical norms, legal requirements, and standards of appropriate behavior. By employing survey data from 4,166 South Korean bureaucrats, Kim et al. (2021) examined the impact of transactional and transformational leadership on UPB in the public sector to understand these challenges better. Kim et al. (2021) also investigated how the relationship between leadership and UPB is moderated by public service motivation (PSM). Kim et al.'s (2021) results demonstrated that leaders' influence can affect followers' immoral behavior for the business's good. Still, the direction of the impact can change based on the leaders' leadership style. Overall, Kim et al. (2021) offered an intriguing viewpoint on transactional and transformational leadership and how it may impact followers, offering a distinct angle on leadership in today's age of advanced technology.

The synchronization of IT and business objectives has become increasingly crucial with the rise of e-businesses. Information technology is a cutting-edge field that allows entrepreneurs and leaders to learn about business strategies for observing human resources and consumer behavior. A study conducted Wang et al. (2021) sought to ascertain the influence of transactional leadership on IT-business process alignment and to analyze the moderating role of organizational

culture in this connection. Wang et al.'s (2021) results revealed that entrepreneur behaviors such as contingent compensation and managing by exception are essential factors that influence the alignment of IT and business processes. They also showed a gap between transactional behavior factors in IT-business process alignment and how executives may use such behaviors to their advantage when modifying strategic plans to create satisfying consumer products. Wang et al. (2021) contributed to the study by focusing on the significance of transactional leadership in implementing IT strategies.

Adaptive Leadership Theory. One of the main problems contemporary leaders face is setting up and enabling their organizations and human resources to adapt to today's dynamic and demanding global business environment. Uhl-Bien and Arena (2018) presented a theoretical synthesis and integrative assessment of research from several domains that, when taken together, can provide an understanding of leadership for organizational adaptation. Uhl-Bien and Arena's (2018) analysis demonstrated that organizational adaptability leadership differs from traditional leadership. It entails facilitating the adaptive process by allowing ideas to put forth by entrepreneurial leaders to interact in tension with the operating system and produce innovations that scale into the system to satisfy the adaptive needs of the company and its surroundings. With increasing technological advancements, organizations must, therefore, create HR, coaching, and talent management systems that can aid individuals in navigating these procedures to endure and even thrive in environments where performance and adaptability are highly valued.

Ohlsson et al. (2020) also contended that rapid developments in today's business environment, such as the globalization of the workforce, more usage of virtual connection, and technical advancements, are placing more and more pressure on businesses and leaders to be adaptive. Ohlsson et al. (2020) conducted a qualitative study to understand the leadership traits

that leaders need to be adaptable in a hierarchical organization and the predisposing variables that may affect the development of these traits. According to the study, leaders employ smooth organizational power to increase adaptability. They do this by utilizing structural, emotional, and relational smoothness. A leader's contextual judgment is influenced by their professional background, experience, and organizational environment, which all interact as antecedent factors.

Zhang et al. (2021) also explored the concept of management adaptability and provide organizational, economic, and policy suggestions for practitioners to create competitive advantages as a globalized digital economy takes hold. The study integrates adaptability construction components and creatively creates a multi-level business management adaptability framework by highlighting recent research findings and their shortcomings. Zhang et al. (2021) emphasized the value of establishing performance evaluation systems concentrating on a company's profitability while investigating and balancing relationships between its internal and external settings. Zhang et al. (2021) argued that businesses must synthesize their experience in self-development, innovate in constructing indicators, and forge strong ties with academia to provide a theoretical foundation with practice and encourage development in this direction. Zhang et al. (2021) contributed to the research by examining adaptability in the face of emerging technological advancements while emphasizing the necessity to develop measurements around business profitability and investigating and counterpoising relationships between internal and external settings to quantify performance.

Situational Leadership. Many studies have shown that the situational leadership model encourages managers to adapt their leadership approach based on changing circumstances to achieve high levels of productivity and performance. Princes and Said (2022) conducted research

to examine the complexity theory-based aspects that affect project management's ability to remain financially viable in the face of complexity. The study employed a quantitative approach to analyze the elements impacting financial sustainability and how they connect to address project complexity challenges and provide financial sustainability. Based on the study's findings, economic sustainability is increased by practical project complexity management, staff performance readiness, situational leadership style, and leader trust. The study's conclusions offer solid empirical support for further project management research, which also correlates to the current study because of the flexibility in situational leadership style, which is crucial in implementing technological advances for effective management.

These findings are further reinforced by research by Aslam et al. (2022), which offers businesses theoretical support and practical guidance for developing situational leadership and reducing employee burnout to boost motivation and job satisfaction. Aslam et al.'s (2022) objective was to assess how COVID-19 has disrupted the normal business flow in all organizations, particularly regarding job satisfaction and motivation, and to evaluate the contribution that situational leadership can make to fostering a productive workplace in the face of difficulties. Their findings show that situational leadership helps employees define their experiences at work as they adjust to new realities and settings, positively impacting work motivation and job satisfaction. Overall, the situational approach has been proven effective in virtually any organization and at nearly any level for almost any goal, and it is exemplified by the idea that COVID-19 forced the adoption of new technologies at an unprecedented rate.

Constructs and Variables

Leadership Skills. Afsar and Umrani (2020) investigated the effect of transformational leadership on employees' innovative work behavior, the mediating role of motivation to learn,

and the moderating role of task complexity and innovation climate on the link between transformational leadership and creative work behavior. The study implemented a unique model with five independent variables to analyze inventive employees' behavior from many levels of perception, assignment intricacy at the command level, and innovative environment and governance at the institutional level. The conceptual presumptions that creative workplace conduct arose from the combination of personal, collective, and company-level elements were supported by an integrative system that used determinants from several stages. Results were significant in that they demonstrated that creativity in the workplace was positively impacted by transformative leadership and was moderated by enthusiasm for learning. The research also revealed that the association between transformative leaders and workers' creative work habits was tempered by job complexity and the environment for innovation. Therefore, Afsar and Umrani (2020) supported the research by highlighting that those leaders face an uncertain future due to emerging technology.

Alat and Suar (2020) explored leader flexibility in the manufacturing sector to understand the nature of uncertainties that leaders face and how their attributes facilitate them in responding to uncertain situations. Alat and Suar (2020) recognized the two main issues requiring flexibility and skills: the elements that call for versatility and the success criteria, including modifications to the outside environment, balancing competing demands, unpredictable personnel availability, and daily uncertainties, all contributed to the necessity of versatility. Assessing the surroundings, predicting alterations, establishing common understanding, fostering adaptation in personnel, comprehending discrepancies, and coming up with alternative solutions were all a component of the performance standards (Alat & Suar, 2020). Capabilities comprised juggling many responsibilities, principles, and habits; mentoring and team-building abilities; systems-thinking

abilities; social competence; conflict-resolution abilities; and a willingness to acquire knowledge. Alat and Suar (2020) supported the current research by highlighting that leaders face an uncertain future due to emerging technology.

Ayoko (2021) suggested that resiliency and leadership may be a skill that can buffer stress and uncertainty associated with organizational crises, turbulence, and disruptions. Ayoko (2021) showed that leadership personalities descended via job creation and diffusion strategies. Structural power, objective, and disposition ambiguities that underlie the evolution of collaboration and teamwork were also noted. Contradictions between hierarchical systems and decentralized connections, work engagement and employee creativity, tiredness and revival, and skepticism and evangelizing were discovered among these inconsistencies (Ayoko, 2021). The findings thus supported an indirect link between servant leadership and flourishing organizational behaviors by individualistic work attitudes. Notably, Ayoko (2021) showed that when people have high foundational personnel, the association between servant management and company flourishing is better, supporting the current research by highlighting resiliency as a needed leadership skill.

Bragger et al. (2021) proposed a model of how leaders should have a balanced and integrated development across spiritual, cognitive, social, emotional, and moral domains that can result in a servant-leader orientation to deal with the needs of an organization. This article supports this research by adding the importance of servant leadership to the tools a leader uses to deal with organizational changes. It evaluates systemic hurdles for advancing the spiritual, intellectual, interpersonal, emotive, and ethical spheres, pertinent ideologies, traits, and how concepts connect to formation. Consequently, the study revealed the connection between these managerial capabilities and the servant leadership parameters and how every evolutionary

dimension affects leadership capabilities. These results led to the conclusion that embracing servant leadership is a prerequisite for having empathy for others, suggesting a connection between personal enlightenment and the emergence of servant leaders.

James et al. (2021) examined a leader's power motive and how strong power motives directly affect organizational performance. This article supports this research as power motives are an aspect of situational leadership and can be seen as a leadership skill leaders need to lead through emerging technology. It makes the case that the claim that the application of authority has been made to be a more basic human requirement than the requirement to survive is inaccurate and that by depending too much on it, people have come to fail to comprehend the true way power works and how it is used by those in positions of authority levied with enhancing effectiveness. The article concludes that individuals responsible for choosing leaders should focus on how people with solid power motives use their positions differently. This use of power will assist in selecting the executives who are best suited to deliver structural success.

Luria et al. (2019) aimed to understand how the leadership effectiveness of the trainer in a leadership development program can influence emerging leaders' development and efficacy. This study supports this research by discussing the importance of a leadership development program. This study evaluated a year-long prospective research survey that tracked armed services cadets' official management positions as active officers from when they first emerged as peer leaders informally throughout basic training via the officer training course (OTC). The findings indicated that their performance during OTC mediated the correlation between the formation of informal leadership throughout basic training and the cadets' later success as formalized superiors. Also, instructors' efficiency tempered the association across cadets' unofficial leader performance and competence in OTC. According to the findings, developing

informal leaders with skilled instructor monitors has a higher chance of becoming influential institutional figureheads.

Magesa and Jonathan (2021) aimed to examine the attributes of a compelling leader to lead digital transformation in a formal organization. The study supports the current research by examining the qualities needed for a leader to lead a digital transformation. The paper develops a notion of a digital leader comprising 26 traits into five categories. Twenty-three elements were subjected to interpretive component analysis, yielding seven factors divided into five functions. Two components, each with one element, were dropped. For a confirmation factor analysis, which offered a superior fit for the data collected, only four variables and 13 items were eligible. A self-reported questionnaire was utilized to collect the data, and sample respondents were chosen from a few Tanzanian institutions. Considering this, the findings revealed that the concept of digital leadership ultimately integrates four distinct variables. It is inferred that solid digital leadership will support economic expansion, encourage innovative thinking and entrepreneurship, and enhance service delivery.

Newstead et al. (2021) advanced a virtues-based approach to developing exemplary leaders and leadership. This research supports the current study, looking at leadership skills critical in multiple business domains. This, the article clarifies how virtue influences effective leadership across various fields. It also explains five synergies of fundamental precepts leadership development, such as how a qualities methodology explains organizational efficiency and morality, how governance and moral rectitude can both be learned, the connection between morals, personality, and governance, the cohesion and homogeneity of morality, and how moral rectitude acts as a connecting thread between the person’s best interests and the good of society.

Three paths characterize the growth of virtues-based governance. This article addresses the research and application of creating influential leaders.

Ngayo Fotso (2021) aimed to generate a clear understanding through a literature-based overview of the relevant leadership competencies for the 21st century in their study. This paper directly relates to this study on the need for leadership skills in the 21st century, which correlates to leadership supporting emerging technology. In addressing the increasing demand for clarification regarding the necessary governance competencies for the 21st century, the study convincingly demonstrates why it is crucial to integrate and define vocabulary applied in leadership theories. It lists 18 categories of leadership skills needed in the 21st century. According to the findings, leadership in the 21st century must be capable of integrating a fundamental empathy for individuals with an understanding of customer satisfaction, digitization, financial liberalization, and the common good.

Soliman (2020) analyzed the effect of leadership empowerment dimensions on technology transfer effectiveness considering knowledge transfer in the telecommunication sector. Knowledge transfer through leadership empowerment can be regarded as a leadership skill to apply to the telecommunications sector and all emerging sectors that correlate to this research. Significantly, this study's findings showed strong and favorable correlations across management engagement as a continuous and discrete concept and every aspect of the success of technical assistance, encompassing goods and procedures effectiveness, the profitability of the company, and workforce development competence. The findings also demonstrated that supervising workers had the most negligible impact on technological transmission efficacy while mentoring workers had the most significant impact.

Torre and Sarti (2020) examined whether enterprises that use leadership as a necessary "tool" to manage workers are as effective as organizations adapting more modern E-leadership techniques utilizing information and communication technologies, changing relationships among workers and business leaders. This article supports this research by looking at new leadership skills needed in this time of advanced emerging technology. This article included 15 Italian firms. The assessment was done over two periods of time. The article's findings clearly show that, while there has been an increase in e-leadership knowledge, the increasing prevalence of technology plays a significant part in the shift in leadership along with a renewed focus on soft skills. Four distinct e-leadership categorizations are identified, summarizing various approaches to understanding it and outlining their key characteristics.

Yao (2021) explored the practical uses of triads of three things or three perspectives in the decision-making process: numerical, textual, and visual. This paper brings a unique perspective to this research as a potentially needed leadership skill in managing advanced technology. In terms of basic geometrical concepts such as dots, lines, triangles, and circles, besides more sophisticated structures deriving from these basic concepts, this article discusses object shapes, graphics, and semantic and syntactic readings of triads. The paper demonstrates the applications of these elements and their fundamental readings for triadic cognition, triadic programming, and triadic perception using these and other illustrations from other subjects and domains. This article combines three typical forms of thinking—numerical cognition, textual reasoning, and visual thinking—by adhering to the concepts of triadic cognition.

Zhao et al. (2021) examined leadership behavior and social identity theories. Zhao et al. (2021) conducted an empirical study with 361 millennial employees to explore the mechanisms underlying the impact of charismatic leadership on employee innovation performance. This

paper is another perspective on the leadership skills needed to lead in modern times. The research presented in this study provides a new framework to comprehend the processes by which inspirational motivation influences the intellectual capital of millennial employees. The findings demonstrate that idealized influence significantly improved the innovativeness of millennial workers and that individuals' affiliation somewhat moderated this link with governance, career development, and employer. Employees' governance and professional recognition, managerial and corporate recognition, professional and managerial classification, dominance, expert, and work engagement also had a serial mediating influence.

Organizational Leadership Culture. Research suggests that the complementary nature of a leader's and a team member's traits facilitates shared leadership in teams and fosters team creativity. In their study, Ali et al. (2020) explored the mediating role of formal participative leadership for indirectly enhancing team creativity by promoting shared leadership. The researchers integrated insights from social learning theory and the dominance complementarity perspective to achieve this with the team leadership and creativity literature. According to the authors, team voice behavior and creative efficacy define the boundaries between formal participative leadership, shared leadership, and team innovativeness. Shared leadership is believed to give team members the freedom to be creative by offering them authority, control, and the assurance that their contributions will be acknowledged. Their study's findings showed a strong correlation between participative leadership and shared leadership in teams, which were both favorably associated with innovative team behavior. Ali et al. (2020) lent credence to the current study because it emphasizes how corporate culture influences leadership capacity.

Businesses need agile, flexible, and future-oriented technology leaders more than ever to be able to deal with today's unprecedented uncertainties. According to Bleich (2021), leaders

must develop technical skills to prepare and adapt to the rapidly changing global business environment. In his study, the author investigates how technological education affects leaders' ability to promote innovation and oversee change by adapting to emerging circumstances. The study evaluates three technology categories and provides examples of approaches to boosting technology literacy. Then, five emergent or quickly advancing technology developments provide a framework for leader development. The findings of the study reveal that emerging technologies have a significant impact on leadership development. Leaders must be technology-driven to increase team members' productivity and organizational effectiveness. Bleich (2021) contributed to this research by discussing the value of advancing leadership abilities, a crucial component of corporate culture.

Douglas et al. (2022) sought to invest in the impact of leadership development programs (LDP) on organizational effectiveness. This study focused on collective leadership, which is the premise that people within a leadership system assist networks and organizations in moving toward a common objective. The perceived influence of LDP on organizational effectiveness was investigated. The results showed that LDP supports collective leadership competence, social capital development, and human capital management strategies, positively impacting organizational effectiveness. LDPs contribute to human capital accumulation as a resource at the organizational level. The study's conclusions address how leadership development initiatives affect organizational success and indicate that collective leadership ability, human capital, and social capital development positively impact organizations' performance. Douglas et al. (2022) findings provided evidence for the research by showing how LDP aids firms in acquiring and accumulating intangible resources through human capital.

One of the most pressing issues in technology leadership today is the alignment of information technology with business strategies, which has gained significance. Gutierrez et al. (2009) aimed to determine whether the distinctions between small, medium and big firms affect how these enterprises view strategic alignment based on the alignment between IT and business strategies. Based on the strategic alignment theory (SMT), the study's findings revealed that, despite the differences between small and medium-sized businesses and large organizations regarding resources and IT skills, the criteria identified as relevant to achieving alignment seem to be constant. The data obtained strongly suggest that organizations can increase their chances of using IT and achieving higher levels of alignment by adopting a simultaneous strategy. Gutierrez et al. (2009) contributed to the body of knowledge about how the effectiveness of organizations is impacted by the alignment of technology and business strategy, which provides significant insights for the current study.

Husain et al. (2022) contended that in the contemporary era of knowledge and information, organizations must continue to use complementary processes like creativity and innovation to stay ahead of the competition. The objective of their research was to create and empirically test a model that examines the mediating function of technology development capability (TDC) on the relationship between customer focus (CF) and technological leadership (TL). The consensus among practitioners and academics is that management sponsorship (MS) improves the link between CF and TDC. Also, it is well acknowledged that MS mediates TL initiatives. The results of this investigation, however, defy these presumptions. The research shows that MS does not affect the links between CF and TL but negatively moderates CF and technology development capacities. Husain et al. (2022) contributed to knowledge about innovation, contemporary technology in general, and leadership styles.

Martinez-Climent et al. (2019) found that ambidextrous leadership affects workers' creativity and performance. This study aimed to provide insights into ambidextrous leadership and assess how it relates to a social entrepreneurial perspective. The primary objective was to evaluate social entrepreneurship's impact on businesses' operational performance. The study findings revealed that ambidextrous leadership and social entrepreneurial attitude are mutually supportive and can impact corporate goals and objectives. Notably, it was found that reciprocity affects organizational culture and open-minded leader behaviors, which fosters innovation. Martinez-Climent and colleagues (2019) demonstrated how ambidextrous leadership gives organizations the adaptability and flexibility to manage cutting-edge and new technology.

Megheirkouni and Mejheirkouni (2020) researched to comprehend the difficulties organizations face in the 21st century and assess solutions by recommending future leadership development based on pertinent leadership theories, which would inspire and streamline future research directions. The qualitative study used the integrative technique to review the theoretical and empirical literature on leadership development. Megheirkouni and Mejheirkouni's (2020) findings supported the argument that leadership theories serve as the cornerstone for leadership development, mainly when those theories are intended to address and overcome the problems organizations are now confronting. They contend that organizational issues and theories of leadership development are complementary. Megheirkouni and Mejheirkouni (2020) contributed to the research by analyzing how leadership theories and development impact organizational culture.

Samai and Campbell's (2021) article, which focused on the healthcare sector, examined how physician preferences for work-life balance and effective leadership structures have made engagement, teamwork, and organizational culture critical for the long-term survival of medical

practices. The authors argue that techniques and organizations with a strong culture and engaged workforce create more substantial teams, eventually increasing competitiveness. Leaders must actively teach and foster the distinctive culture of their organization (Samai & Campbell, 2021). By instructing and imitating others, staff members will increase their level of engagement and acculturate a practice's culture. Samai and Campbell (2021) supported the research on how specific corporate characteristics impact organizational culture.

Spiegler et al. (2021) investigated a leadership gap in the role transmission of information based on the team dynamic to examine the type of leadership required to support agile teams. Drawing on Pearce and Conger's definition of shared leadership, the author emphasizes the relationship between one committed individual who assumes leadership and sharing leadership with team members. They use the Scrum Master as an illustration to discuss leadership in agile teams. They view the committed Scrum Master as a leadership enabler who works toward empowering a team to collaborate effectively and share leadership. The study's findings show that while role conflicts may hinder role transfer, a leadership gap and a positive internal team climate enhance the process. A mature team has to give team members the trust and flexibility to assume the leadership role that the Scrum Master once held. This will allow the Scrum Master to change. Spiegler et al. (2021) provided a new perspective on the significance of corporate culture.

A study by Suryaningtyas et al. (2019) aimed to advance leadership knowledge in the technological era by examining the links between organizational resilience and performance directly and indirectly, with resilient leadership and organizational culture as mediators. The research results showed a strong correlation between organizational effectiveness and resilience. The model utilized in this research is mediated substantially by resilient leadership and

organizational culture. The authors assert that from the standpoint of practical significance, organizational resilience is connected with resilient leadership because of its considerable impact. The main argument by Suryaningtyas et al. (2019) is that the business environment has changed tremendously, and organizational culture will impact how well a company can adapt to the fourth industrial revolution.

Related Studies

Digital technologies are prompting organizations in the construction industry to feel the pressure of modernizing their operations. Like any other change form, digital transformation requires leaders to work extra hard and pursue digital innovation. Zulu and Khosrowshahi (2021) conducted a study to determine the different leadership approaches that can be adopted in the construction industry to introduce a digital path using the inductive thematic analysis approach; 41 construction professionals were analyzed. The taxonomy to classify the findings was based on various themes such as visionless and undriven, supportive, cautious, forward-thinking and proactive, uncoordinated, and resistant leaders (Zulu & Khosrowshahi, 2021). According to the researchers, this was the first-ever taxonomy study in the construction industry. This futuristic step opened the door to understanding how leaders in the construction industry can affect digital transformation. Therefore, the taxonomy of digital leadership in the construction industry can be used to evaluate leadership attitudes, perceptions, and styles toward digitalization. The results also left room for further research on digital transformation in the construction industry.

Organizations constantly seek ways to improve their sustainability and competitiveness in a rapidly changing business environment. The relationship between innovation, servitization, and digitalization can significantly affect organizations' success. For instance, servitization creates new opportunities for digitalization, such as using sensor data to give maintenance services

(Shen et al., 2021). On the other hand, digitalization facilitates innovation and performance by providing the necessary tools and resources to develop and test products. Finally, innovation is the ability of organizations to create new products, processes, and services that add value to the organization and companies (Shen et al., 2021). Organizations that embrace innovation, digitalization, and servitization have a higher chance of remaining sustainable and competitive in a dynamic business environment. These factors are essential in helping organizations improve customer experience, create new revenue streams, reduce costs, and optimize operations (Shen et al., 2021). It is important to note the relationship between these factors because they are essential in increasing competitiveness. Digital transformation and innovation management are crucial in improving service and product performance.

In a rapidly changing business environment, possessing 21st-century digital skills help in innovation capacity and organizational competitiveness. Although such skills are essential, the digital aspect of integrating them is not fully defined. van Laar et al. (2017) conducted a systematic literature review examining the relationship between digital and 21st-century skills. The study also intended to formulate 21st-century digital skills with operational components and theoretical dimensions to sharpen workers' knowledge. One thousand five hundred ninety-two (1592) articles were screened, and results showed that 21st-century digital skills are more important than digital skills (van Laar et al., 2017).

On the contrary, unlike digital skills, 21st-century skills are not underpinned by ICT. The researchers also identified various essential skills in linking digital and 21st-century skills. These skills include collaboration, creativity, technical information management, problem-solving, and communication (van Laar et al., 2017). The skills show that they are related to contemporary social and economic developments than those associated with traditional industrial modes of

production. The skill sets are critical for employees to keep up with innovative processes and ideas.

Digitalization presents managers with new challenges, making digital leadership an essential topic of discussion as they try to mitigate these factors. Using the required literature and qualitative analysis, Zeike et al. (2019) conducted a study examining whether digital leadership is related to the psychological well-being of upper-level managers. A survey was conducted on 368 managers from a German ICT company. Results indicated that managerial experience, gender, and age did not affect the outcomes. However, more research is required to determine the causal impacts of the relationship between well-being and digital leadership (Zeike et al., 2019). Digital transformation processes are a challenge to organizations going through change. Digital leadership and digital literacy influence the well-being of managers because of the different roles under their watch. There is an association between the demand for work and adverse health outcomes, implying that managers' working conditions can impact their well-being. It is crucial to note that the psychological well-being of managers is a multi-dimensional concept that involves satisfaction with life and self-esteem.

Industry 4.0, the Fourth Industrial Revolution, is essential in advancing customer interactions, manufacturing processes, and supply chain management. It relies on integrating technologies such as the internet of things (IoT), artificial intelligence (AI), robotics, and big analytics to enhance manufacturing efficiency and create smart factories. Szász et al. (2021) conducted empirical research using a systematic literature review. The study was based on a survey of 705 manufacturing firms from 22 countries. A structural equation modelling was adopted to determine the relationship between various areas of interest and provide a detailed analysis of the main effects. Results indicated that Industry 4.0 positively impacts operational

performance, including flexibility, cost, delivery, and quality performance (Szász et al., 2021). The findings also showed that multinational corporations do not have advantages over local firms and that larger firms invest more heavily in Industry 4.0 technologies. Companies with these technologies are more competitive and are more aware of opportunities that keep them sustainable.

Adopting a lean approach to digital transformation, organizations must leverage technology to drive operational efficiency and productivity while fostering a culture of continuous improvement and innovation. Lean production and purpose industry 4.0 play a crucial role in performance improvement. Combining the two concepts is effective, but more understanding is required to advise organizations on embracing digital transformation to make them successful. Rossini et al. (2021) studied how manufacturing firms adopt digital transformation and its effects. Different case studies were included to yield convincing results. Organizations were identified based on their lean maturity, and digital transformation patterns were analyzed and assessed from literature and cases. Results indicated how lean influences digital transformation. Two patterns were identified: disruptive and sustaining digital transformations (Rossini et al., 2021). Both patterns promote a lean culture, which plays a significant role in digital transformation. From the findings, lean promotes digital transformation patterns in organizations.

Increased advancements in Industry 4.0 are bringing new changes in how organizations work. Technology acceptance is still a new field that requires more research to reduce resistance to change and promote acceptance of using new systems and tools within organizations. Molino et al. (2021) conducted a qualitative study to explore the perception of Industry 4.0 and how its transformations lead to technology acceptance. While there is little research on technology

acceptance, this study incorporated its relationship with work engagement. The researchers used 14 perceptions from an organization that was using Industry 4.0. Two hundred sixty-three (263) employees from the same organization filled out questionnaires to get more solid feedback (Molino et al., 2021). Results showed that job resources (i.e., role clarity and supervisor support) were antecedents of technology acceptance and associated with work engagement. The study offered a platform where various interventions would promote technology acceptance and mind employees' welfare in organizations undergoing Industry 4.0 transformations. Investments in communication and leadership 4.0 development programs are essential in promoting technology acceptance.

Many organizations around the globe are investing heavily in digital transformation by upgrading and updating their services, hardware, and software. Such investments are expected to be $2 trillion, and the digital talent gap in employees poses a challenge to successful implementation (Nair, 2019). To overcome these challenges, organizations must take several skills such as investing in training, research, and development, identifying the digital skill gaps, partnering with educational institutions to help deliver training programs that align with the organizational needs, offering competitive benefits and compensation, and fostering inclusion and diversity (Nair, 2019). By considering these steps, organizations can avoid the digital talent gap and create a team determined to promote innovation and digital transformation. To get the information required to analyze digital transformation, questionnaires were filled out by human resources (HR) departments, employees, and leading teams in over 100 medical institutions, banks, insurance, and digital technology development institutions within India and the UAE (Nair, 2019). Results showed that the introduction of new technology increased digital talent gaps. Lack of upskilling employees also widens the gap.

The introduction of 5G technology is expected to significantly impact the manufacturing industry, with potential benefits such as increased automation, reduced downtime, and improved efficiency. Using the Technique for Order of Preference by Similarity to the Ideal Solution (TOPSIS), Lundgren et al. (2021) conducted a study to examine the effects of 5G technology on manufacturing processes. A mixed-method approach, including modified TOPSIS, yielded better results. According to the findings, 5G technology primarily affected flexibility, productivity, and maintenance performance (Lundgren et al., 2021). Linking 5G in the manufacturing processes instead of network performance will help clarify the manufacturing process, facilitating deployment and investment of 5G in manufacturing industries. 5G brings transformation by offering sustainable and competitive production systems (Lundgren et al., 2021). It also promotes attaining the required connectivity needs in digitalized manufacturing with high reliability, low latency, and high data rates. Digitalized manufacturing radically changes the industry by enhancing transparency and allowing decentralized decisions. This is enabled by technologies such as cyber-physical systems (CPS), big data, cloud computing, and IoT.

Leadership succession planning is vital in today's digital transformation economy because organizations must continually adapt and innovate to remain relevant and competitive. Digital transformation is changing how organizations compete in the contemporary business world (Jackson & Dunn-Jensen, 2021). To deal with this, human resources (HR) practitioners must reevaluate the leadership practices and structures that utilize key competencies while striving for innovation. They should also ensure that big data is incorporated with predictive analytics. While digital transformation enhances organizational processes, it also creates considerable challenges. According to a study by Deloitte (2015), 91% of employees believe that digital transformation affects how they do their work, while 41% are content with how

employers respond to digital trends (Jackson & Dunn-Jensen, 2021). Since digital transformation is a disruption, HR executives must ensure employees have the necessary skills to handle change and promote leadership succession planning. HR executives must understand the main external opportunities and challenges that affect organizations. They must also know the required skills to ensure that all stakeholders possess the competencies to drive change (Jackson & Dunn-Jensen, 2021). Finally, they must understand why leadership succession plans are essential in organizations. Leadership succession planning requires approaches that align with organizational culture and objectives.

Artificial intelligence (AI) is transforming organizations' operations, and its impact will likely become more significant. As more applications are introduced, AI will have global transformations in the economic and social structures, like other general-purpose technologies such as electricity, railways, roads, and the internet (Howard, 2019). Emerging technologies such as sensors, quantum computing, robotics, AI, and advanced manufacturing are changing how organizations do business. A United States, China, and the European Union forecast suggests AI will have transformative impacts in all industry sectors (Howard, 2019). It will drive economic change and promote improving global economic welfare. Novel application of AI in the future raises some issues related to occupational health safety researchers, employers, employees, and practitioners. As AI applications are integrated into workplaces, knowing their impact on organizational and employee success is vital. Leaders should formulate strategic forecasts that anticipate and prepare for all the possibilities and challenges of AI implementation (Howard, 2019). AI increases the automation of processes, increasing the efficiency and effectiveness of operations.

Digital transformation is a primary concern in contemporary organizations as technological advancements impact businesses. Most organizations are in the early stages of digital transformation (Henderikx & Stoffers, 2022). It is crucial to note that digital transformation does not only affect technological change. It goes beyond that because it affects the organization and its processes. Besides cultural, strategic, and organizational challenges, digital transformation encourages leadership and management challenges. Henderikx and Stoffers (2022) studied how digital transformation impacts future management and leadership behaviors. The PRISMA protocol inspired the exploratory approach implemented in the study. Results showed that digital transformation is a disruption that affects the whole organization, including how it is run. Understanding the power of digital technology is crucial, as it is essential to possess soft skills such as humility, empathy, and integrity (Henderikx & Stoffers, 2022). Digital transformation brings exciting opportunities to handle quantifiable managerial roles and evaluate performance, encouraging the redefinition of leadership requirements to keep up with technological advancements.

Another aspect of Industry 4.0 and digital transformation is a concept called gamification. Gamification involves incorporating game-like elements into non-game contexts to enhance employee engagement by providing level-based instructions and personalized feedback (Ulmer et al., 2023). In manufacturing, this can mean using point scoring, leaderboards, challenges, and rewards to make routine tasks more engaging and enjoyable for workers. In past generations, worker enjoyment was not a consideration, but as labor challenges are arising in manufacturing, it is becoming essential to evolve the need to attract and retain the next generation of workers.

Seo et al. (2020) noted that when workers are in an optimal physical and psychological state, they have a higher work performance. However, the challenge lies in keeping the workers

from being bored with highly manual processes and tasks. Spahrbier et al. (2022) stated that monotony and boredom can result in mental strain after only a few minutes, so it is essential to observe the production progress. Gamification is an aspect that keeps workers engaged and reduces the mental strain that can come with inevitable repetitive manufacturing progress.

Gupta et al. (2021) noted five considerations to improve employee engagement mechanics with gamification that should reduce the monotony and boredom of highly manual manufacturing processes. The first consideration of gamification is that the behaviors of employees change, followed by the second consideration: the milestone challenges give a sense of accomplishment and increase self-esteem (Gupta et al., 2021). The next is a form of actual or virtual badges or awards as the worker moves through the interface, which leads to the fourth consideration, where the employee can customize aspects of the interface to feel empowered, and lastly, some concept of a leaderboard that promotes healthy competition among peers (Gupta et al., 2021). Gamification is starting to prove to be a valuable tool for modernizing the manufacturing sector, and it should be a consideration by any organization looking to stay ahead of the curve to attract and retain workers.

Anticipated and Discovered Themes

Increased globalization significantly impacts social, economic, and political changes. Several technologies have emerged, including the Internet of Things (IoT), Big Data analytics, Cloud Computing, Internet of Services (IoS), and AI (Zeba et al., 2021). These technologies are the basis of Industry 4.0, which has enhanced the manufacturing industry by introducing intelligent processes. Industry 4.0 is characterized by innovative technologies that are crucial in modern manufacturing. Zeba et al. (2021) offered scholarly literature on AI in the manufacturing sector before and after the emergence of Industry 4.0. Content analysis was adopted, and results

showed that smart manufacturing, big data, deep learning, and real-time scheduling are more popular topics today (Zeba et al., 2021). It is important to note that AI is considered the key technology in smart manufacturing and Industry 4.0.

Tūtlys and Spöttl (2022) conducted a study to expose the effects of the 4th Industrial Revolution on professional and vocational qualifications and their systems. The research also sought to enhance an active discussion between researchers and experts on the changes in professional and vocational qualifications shaped by the arrival of the 4th Industrial Revolution (Tūtlys & Spöttl, 2022). The study was based on two case studies that were compared and analyzed. Results indicated that the content and structure of vocational education and training (VET) and qualifications in a 4th Industrial Revolution context depends on learners' skills, the extent of VET provision, sectoral policies, and the state of technologies (Tūtlys & Spöttl, 2022). The work processes and qualifications must be integrated into the curriculum to harness collective approaches to qualifications.

Rapid technological changes are transforming product development activities and production processes. The impacts are radical and have led to the emergence of Industry 4.0. Industry 4.0 offers flexibility, and efficient products are created, enabling organizations to have mass production (Kinkel et al., 2022). AI is one of the technologies affecting organizational processes. Previously, AI was only associated with the future. Today, it deals with specialized approaches and algorithms that impact corporate strategic plans and models. Research on AI has seen significant changes over recent years. However, it is essential to note that most studies have focused on the technology but not the enablers for adopting AI at an organizational level (Kinkel et al., 2022). For various reasons, some organizations are more determined to adopt AI technology than others.

Servitization and digitalization are two crucial trends in the manufacturing industry that can significantly impact organizational performance. Combining both concepts creates more incredible manufacturer benefits (Martín-Peña et al., 2019). Manufacturers can enhance their processes by offering digitally enabled services and creating more value for customers. Research has shown that firms that adopt a servitization strategy can achieve higher profit margins and greater customer loyalty than those that rely solely on product sales (Martín-Peña et al., 2019). Similarly, firms that adopt digitalization technologies can achieve greater efficiency, quality, and innovation, leading to improved financial performance. Overall, servitization and digitalization can help manufacturers stay competitive in an increasingly complex and dynamic market (Martín-Peña et al., 2019). By offering digitally enabled services, manufacturers can build closer customer relationships, differentiate themselves from competitors, and achieve higher profitability and performance.

Things are going fast, making it difficult to anticipate the future. However, even though it is hard to predict the future, it is essential to be careful when predicting future trends, especially during crises such as the coronavirus pandemic (Park, 2021). Predicting future outcomes is an exercise, and through the exercise, prediction errors can be reduced. The exercise is new and can be applied to the rapidly changing educational environment in education. Park (2021) conducted a study using 304 research articles from journals in business education. The articles were analyzed via semantic network analysis, and the results showed that leadership, emphasized teamwork, career, and results-oriented studies are the main agendas with “centered or student-led” (Park, 2021). Business educators can proactively reshape the business curriculum to fit future trends by introducing quality education using advanced technology.

Dachs et al. (2019) conducted a study investigating the relationship between the backshoring of production activities and Industry 4.0. Industry 4.0 supports backshoring by providing higher flexibility and productivity and enticing incentives that allow organizations to locate production close to their European customers (Dachs et al., 2019). The study was conducted on 1700 manufacturing firms from Switzerland, Austria, and Germany. However, it is essential to note that backshoring is a rare event with a 4% share of all firms. Statistics show a relationship between implementing Industry 4.0 technologies and the propensity of organizations to backshoring (Dachs et al., 2019). By adopting Industry 4.0, organizations improve efficiency and competitiveness. It is also imperative to note that fewer countries consider backshoring than offshoring.

Executives cannot know everything about emerging technologies, which is impossible even for business technologists. However, they should know some technologies most likely to impact their businesses (Andriole, 2021). They should seek optimization and best practices to consider technological concepts that meet and exceed business objectives. This can be done through proper operational preparation, planning, and organized deployment. They should be able to explain their existing business models fluently and better than pundits and industrial consultants (Andriole, 2021). They are responsible for optimizing technology and strategically thinking about their businesses to ensure they remain relevant and enjoy competitive benefits. They must also be able to design and create a culture that promotes creative thinking.

Summary of the Literature Review

In summary of the literature review, the manufacturing industry has experienced various changes since the dawn of the revolution and today's era of liberalization, competitiveness, and globalization. The sector has seen crucial expansions in almost all dimensions by attaining

technological advancements (Jain & Ajmera, 2021). The implementation of Industry 4.0 creates smart factories that will transform the current production and manufacturing processes by using smart machines to produce intelligent products. Jain and Ajmera (2021) conducted a study to review the implementation of Industry 4.0 in the Indian manufacturing sector. The Total Interpretive Structural Modelling methodology (TISM) was adopted to determine the relationship between adopting Industry 4.0 and improved processes (Jain & Ajmera, 2021). Results showed that internet facilities from the government are available at a lower price, and continued expertise training and financial support enable reliable driving power.

Summary of Section 1 and Transition

In summary, this research focused on the effects of advanced technology on the business sector, with emerging technology being developed at an accelerated rate, causing a gap in leadership skills compared to the speed of technological advancement. Bailey (2022) noted three areas where emerging technology is affecting organizations that include: emerging technology is increasingly autonomous and intelligent with the ability to supplement human cognition; increased backend analytics that create greater reach of tracking, monitoring, deciphering; and directing the behaviors of individuals and groups. Specifically, the problem will look at this phenomenon related to the skills gap of business leaders managing manufacturing companies in Ohio's greater Cleveland metropolitan area, resulting in lost revenue and business opportunities. The research questions proposed will provide direction to answer the specific problem statement, and each of the research questions will address the research methodology that fits into a positivist paradigm. As discussed, this unpreparedness is due to a skills step gap and is reflected in decreased organizational productivity, efficiency, employee satisfaction, and organizational stability. The research utilized qualitative methods to understand the effects of advanced

technology on business leaders, potentially causing an inability to manage advanced technology due to a skills gap. The positivist worldview will allow the researcher to understand the research participants and their actions and behaviors related to cutting-edge technology. The qualitative methods of this study provided the initial structure for the research but were flexible enough to adjust, allowing ideas to emerge through continued analysis, comparison, and review of specific outcomes. Henderikx and Stoffers (2022) stated that organizations have focused on strategic leadership to lead a digital transformation. Still, currently, there is a lack of information on the skills needed during and post-digital transformation of an organization. The conceptual framework for this study was based on the concept that to reduce the leadership skills set gap, a leader needs to understand transformational leadership, adaptive leadership theory, and situational leadership approach. These three principles create the need for the organization to change due to changes in the business environment.

The remaining research of Section 1 aimed to advance upon existing literature by analyzing leaders' and businesses' actions and behaviors related to management in a time of advanced technology with a qualitative approach to leadership in manufacturing business in Ohio's greater Cleveland metropolitan area. The research parameters will be a multiple case study design that will conduct surveys, interviews, and observations of manufacturing businesses in Ohio's greater Cleveland metropolitan area to determine the impact of advanced technology on business leaders. The role of the researcher and research methodology related to the participants involved in the study, the sample population, and data sampling was provided. An overview of the data collection plan will be provided, including survey questions, data collection, storage, and means to ensure data reliability and validity. This final work will complete Section 1.

Section 2: The Project

Invention has been the catalyst for societal advancement, altering human occupations, changing the business world, and bringing geographically separated societies closer. Industrial revolutions have pushed these societal changes, altered cultural norms, and changed job design and tasking (Kretschmer & Khashabi, 2020). This study investigated the effects of advanced technology on the business sector, with emerging technology accelerated, causing a gap in leadership skills compared to the speed of technological advancement. The study was accomplished through qualitative research with a flexible design utilizing a multiple case studies approach through a positivist paradigm. This case study research looked at the impact of advanced technologies on business leadership—digital transformation reshaping every aspect of the business world, including the people, processes, and platforms. Artificial intelligence, machine learning, and big data provide mountains of data businesses must manage. Nevertheless, it is becoming evident that there is a leadership skills gap compared to the rate of technological advances.

Purpose Statement

The purpose of this flexible design multiple case study was to add and expand the understanding of why the leader struggles to lead during a time of quickly advancing technology, resulting in lost revenue and business opportunities. The research sought to determine the driving factors behind the leadership skills gap and see if there are specific actions and behaviors leaders can take to be more prepared to manage the effects of advanced technology. The more significant problem of the leadership skills gap was explored through an in-depth multi-case study approach of manufacturing businesses in Ohio's greater Cleveland metropolitan area, working to define

actions and behaviors that can be used to mitigate the effects of unpreparedness in advanced technology.

Role of the Researcher

The role of the researcher is to ask good questions, be a good listener, and maintain an adaptive and open-mindedness to newly encountered research situations (Yin, 2018). In qualitative research, the role of the researcher is multifaceted and involves several responsibilities. Qualitative research can be viewed as a craft using a blend of high-quality, well-thought-out research that blends theoretical traditions with experience from the research field (Brown, 2021). The researcher must be grounded in the philosophical underpinnings of qualitative research, which entails a deep understanding and appreciation of the importance of context and subjectivity in shaping human experiences. This approach requires the researcher to commit to reflexivity, acknowledging and reflecting the researcher's worldview, biases, and assumptions. The role of the researcher in this case study was to design research studies, collect and interpret data, and report the findings. The researcher will be prepared for interplay amid the problem of the leadership skills gap in leading through a time of advanced technology in manufacturing businesses in Ohio's greater Cleveland metropolitan area. Yin (2018) described good preparation in case-study-based research, including five things: the investigator's desired skills and values, specific training related to the case study, developing a research protocol, screening of candidate cases, and execution of the pilot case study.

The researcher's action in this study was to adapt the design and implement a research project that employs the appropriate research methods and techniques to develop data to answer the research questions. The researcher collected data from selected participating businesses and business individuals in the study through open-ended and flexible questions, allowing maximum

data collection. The parameters selected for this case study research were conducting interviews, issuing surveys, and observations of Ohio's manufacturing businesses in the greater Cleveland metropolitan area businesses to determine the impact of advanced technology on business leaders. Once complete, the researcher compared the collected data and synthesis against current literature reviews.

The research study collected qualitative data points, such as interviews, surveys, and observations of business leaders in Ohio's greater Cleveland metropolitan area manufacturing businesses. The quantitative data points collected in this research were the demographics of the manufacturing firms, including revenue, employees, gender composition of business leaders, leader's education level, age, and business longevity, to provide context on the experience of the research participants. The validation of all data points was accomplished through triangulation, a multi-level approach that builds trust with reviewers on the transparency of the research presented.

Bracketing is an idea in which the researcher sets aside all of their preconceived experiences to understand best the participants' experiences in the study (Creswell & Poth, 2018). Bracketing is an essential technique for researchers when conducting qualitative research and helps ensure that the researcher remains aware of their beliefs and assumptions, not bias their results. Esmene and Kirsop-Taylor (2021) noted that the studied context influences bracketing related to the researcher. In the case of this research, the researcher has documented leadership and technology and will maintain that their assumptions do not influence the collected data. However, bracketing will allow the researcher to take a holistic approach to data collection and analysis, allowing them to consider all possible sources of information before drawing any conclusions (Esmene & Kirsop-Taylor, 2021).

One key benefit of bracketing is that it encourages critical reflection on the researcher's part and can be applied to explore and understand the recursive nature of structure within an organization (Kennedy et al., 2021). By taking time from data collection or analysis to reflect on personal values and biases, the researcher will be better able to identify potential areas of bias in their work that may otherwise have gone unnoticed. This process also helps researchers gain insight into how their perspectives might influence what they observe during fieldwork or make sense of collected data. In this way, bracketing can be seen as a form of methodological self-awareness that ensures the researcher's work is rigorous and valid, taking into account personal history, social aspects, and the pre-understandings of the researcher (Dörfler & Stierand, 2021).

Another concept that needs to be considered in addition to bracketing is reflexivity. Creswell and Poth (2018) described reflexivity as a process where the researcher positions themselves in the study, referencing their experience, values, beliefs, and biases and how these traits influence their interpretation of the information collected. Reflexivity is a concept that has been widely discussed in qualitative research. It refers to the process of self-reflection and self-awareness when conducting research, which can help researchers gain insight into their biases and assumptions (Florczak, 2021). This type of reflection allows researchers to be more aware of how their conscious and unconscious biases may influence the data they collect or the conclusions they draw from it.

The importance of reflexivity in qualitative research cannot be overstated. Reflexive practices also allow for greater transparency in reporting results by providing readers with information about how the researcher arrived at certain conclusions or interpretations (Dörfler & Stierand, 2021). Esmene and Kirsop-Taylor (2021) noted that by engaging in this reflective practice, researchers could better understand how their own experiences shape their

understanding of a topic and ultimately provide more reliable results. Finally, reflexivity can also improve the quality of research by encouraging researchers to question their assumptions and thought processes, making them more likely to uncover new perspectives (Dörfler & Stierand, 2021). Critical self-reflection by the researcher can lead to a deeper understanding of the research topic and an appreciation for the complexity of the people and issues, leading to a more comprehensive view of data by allowing researchers to consider multiple angles when interpreting results.

This constructivist research seeks to identify an understanding of human beings within a subjective perspective and within social contexts that depend on the beliefs and opinions that interact with and interpret the situation (Bogna et al., 2020). Engaging in reflexive practices such as self-reflection and critical analysis, researchers can better understand how their own experiences may influence both the collection of data and its interpretation. Reflexive practices help maintain an objective stance throughout their study, so conclusions drawn will be based solely on empirical evidence rather than personal biases or preconceived notions about a subject matter. Additionally, being mindful of one's thoughts can help researchers identify potential sources of bias in how they approach data collection activities such as interviews or focus groups.

Reflexivity and bracketing are essential for successful qualitative research. By engaging in self-reflection and critical analysis, researchers can identify potential biases or preconceived notions about a subject matter. Additionally, by setting aside these assumptions while collecting and interpreting data, they can ensure their findings are accurate and reliable. Using reflexivity and bracketing together helps ensure that qualitative research is conducted ethically and responsibly. Both reflexivity and bracketing help ensure that researchers remain faithful to the

data they collect during their study rather than imposing pre-existing ideas or interpretations onto it (Dörfler & Stierand, 2021).

In summary, the role of the researcher in qualitative research involves writing up and disseminating the findings in a way that is accessible and meaningful to the audience. This completed research required excellent writing skills, communicating complex ideas clearly and concisely, and being mindful of the research limitations. The researcher will develop a research design that allows implementation, analysis, and dissemination of the research ground to capture the richness and complexity of the human experience. This research approach requires a deep commitment to reflexivity, ethical considerations, and excellent communication skills. Qualitative research offers a unique opportunity to explore the lived experiences of individuals and communities, and the role of the researcher is critical in ensuring that this opportunity is maximized in a respectful, ethical, and meaningful way.

Research Methodology

The nature of the study was qualitative, with a flexible design and a multiple case study approach within the constructivist paradigm. The case studies will explore the impact of advanced technologies on business leadership—digital transformation reshaping every aspect of the business world, including the people, processes, and platforms. Artificial intelligence, machine learning, and big data provide mountains of information businesses need to manage. A flexible design is an ideal way to approach a research study, as it provides plenty of room for adjusting the parameters and procedures in response to changing conditions. Flexible designs allow researchers to adapt quickly to unexpected changes and shifts in data and create an opportunity to refine the hypothesis or research question as new information arises during the study. Flexible designs are an effective way to approach the types of research due to their

versatility and ability to adjust as conditions change. Not only do they allow researchers to explore various questions and hypotheses, but they also help ensure that research remains relevant to current trends. Ultimately, these designs can provide valuable insights into a topic or hypothesis that rigid study designs could not achieve.

Discussion of a Flexible Design

This study was conducted with a flexible design using qualitative methods. Specifically, a multi-case study design was used. A flexible design over a fixed structure was chosen because fixed plans are more rigid and tend towards quantitative research. In contrast, qualitative research is context-dependent, and the researcher uses the shared experiences of the research subjects to develop a holistic account of the problem (Creswell & Poth, 2018). Flexible design is beneficial for exploratory research, as it allows the researcher to explore a variety of possible explanations or results (Robson & McCartan, 2016). Robson and McCartan (2016) noted that flexible designs could help researchers identify gaps in knowledge and add layers of understanding to existing data points. This type of design can help researchers gain a more comprehensive picture of their topic or hypothesis by making adjustments throughout the study. A flexible design is appropriate because qualitative business research is essential for understanding leader behavior and developing effective management strategies for future technological changes. A flexible design approach to qualitative business research is often the most appropriate choice, as it allows researchers to adjust their methods in response to changing conditions or new information. This flexibility can help ensure that the research yields more accurate results and provides a better picture of customer needs and preferences.

It is becoming evident that there is a skills gap in leading and managing compared to the rate of technological advances. The skills gap is due to technological advances causing

organizations of all sizes to struggle with accelerated technology management due to scale, depth, and urgency to make organizational decisions (McCarthy et al., 2021). These accelerated technology changes have only been amplified with the global pandemic, causing inconsistencies in leadership skills and an unpredictable future. McCahery et al. (2021) stated that businesses failed in their forced adoption of new technologies at an alarming rate during the coronavirus pandemic. Digital transformation through emerging technology is much more than a support function. It includes artificial intelligence, social media, the Internet of Things (IoT), cybersecurity, big data and analytics, cloud computing, and robotic process automation (RPA; Kretschmer & Khashabi, 2020). Business leaders should understand the impact of technology on their business sector so their businesses can adapt to the constant technological changes, maintain market share, and drive future opportunities. This research aimed to understand the skills needed by business leaders and the actions and behaviors that support leading and managing an organization through emerging technology changes. Their leaders need to manage their organizations more effectively through changes in advanced technology.

Flexible design is an appropriate approach for business research as it allows the researcher to adjust their methodology in response to the changing needs of a study. A flexible design emphasizes adapting and responding quickly to environmental changes, which can be especially important when researching constantly evolving businesses. Flexible designs also allow this research to focus on specific aspects of leadership and technology. Furthermore, this type of design allows for creativity and innovation by allowing the researcher to explore new ideas without strictly adhering to predetermined methods or procedures. As such, flexible designs effectively allow researchers to conduct meaningful business research that yields valuable results.

Qualitative research questions assisted the researcher in triangulating the potential reasons for the leadership skills gap in dealing with advanced technology and the role of business in being prepared for future technological changes. A flexible design of multiple case studies addressed the problem of exploring the possible reasons for business failure to prepare leaders to handle the rapid digital transformation in the manufacturing industry in Ohio's greater Cleveland metropolitan area, United States.

Discussion of Triangulation

This research used triangulation in research studies, including meta-synthesis for the literature review of similar existing studies. Triangulation is a method used to increase the validity and reliability of data by combining multiple sources or methods to collect information (Robson & McCartan, 2016). The research conducted addressed the problem of the effects of a gap in leadership skills compared to the rate and status of technological advances will regard triangulation as a research mindset promoting methodological diversity that will lead to qualitative scientific discoveries. Nielsen et al. (2020) related methodological diversity to the necessary rigor in research to reduce any biases, errors, or limitations that could be experienced in a single data collection form. Denzin (2017) documented four types of triangulation: data triangulation, observer triangulation, methodological triangulation, and theory triangulation, as cited in Robson and McCartan (2016). Data triangulation uses multiple methods for data collection, including observation, interviews, surveys, and document review (Robson & McCartan, 2016). Robson and McCartan (2016) noted that observer triangulation is a method where one observer supports the triangulation, and methodological triangulation combines quantitative and qualitative approaches. Theory triangulation uses multiple theories or perspectives. For this research, observer and methodological triangulation will not be used, and

they have been rejected. Methodological triangulation is the convergence of multiple methods upon a single conclusion to support a better conclusion (Heesen et al., 2019). Multiple methods may support a better conclusion, but this process adds unnecessary complexity, time, and resources that will bring enough value.

For this research, two types of triangulations were used: data and theory. Multiple data sources, including observations, interviews, audiovisual material, and documentation, lead to methodological rigor established by the researcher, setting standards for the research process, including the study's data collection, analysis, and reporting (Robson & McCartan, 2016). Data and theory triangulation were sufficient for this study and provided a greater understanding of the effects of emerging technology on business leadership in Ohio's greater Cleveland metropolitan area’s manufacturing sector.

Data triangulation strengthens construct validity in case study research by using multiple data sources and provides different measures of the phenomenon (Farquhar et al., 2020). Theory triangulation was used to help understand the leadership skills gap of business leaders through the lens of existing management and leadership theories. Denzin (2017) outlined three steps for theoretical triangulation consisting of (a) defining the theoretical perspectives, (b) data analysis through a theoretical lens, and (c) theory-building account with sensitivity to fresh theoretical insights (Farquhar et al., 2020).

In this qualitative research, it was essential to show the credibility of the research methods and have multiple means to validate the data. Triangulation is the avenue to address both validity and reliability through the corroboration of sources through the convergence of various interpretations, perceptions, and experiences (Farquhar et al., 2020). This data validation was accomplished through triangulation, a multi-level approach that builds trust with reviewers

on the transparency of the research presented. The researcher's ability in this kind of research was critical. This researcher was able to interpret collected data meaningfully, synthesize findings, and establish meaning from seemingly unrelated information.

Meta-synthesis is one type of triangulation that involves synthesizing qualitative data from multiple sources. This approach allows researchers to identify patterns and themes within the data and draw conclusions about their findings (Robson & McCartan, 2016). A methodological procedure is divided into four main parts: comprehensive search, appraisal of reports of qualitative primary studies, classification of studies, and synthesis of findings (Ludvigsen et al., 2016). Meta-synthesis provides a comprehensive approach by allowing researchers to go beyond simply summarizing existing research and instead explore how different elements interact. This method helped the researcher triangulate findings from various studies and gain deeper insights into the phenomenon under investigation combined with the researcher's collected data. Furthermore, this method also offers greater flexibility for exploring new ideas and hypotheses, which could lead to further discoveries down the line. Ultimately, meta-synthesis provides a tool for synthesizing evidence within this literature review, gaining a fuller picture of any subject matter.

Triangulation for research studies is a valuable tool for improving the validity and reliability of research studies. Meta-synthesis was one type of triangulation that was beneficial in conducting a literature review of existing articles, allowing the researcher to gain more comprehensive insights into their topics. Overall, these techniques helped the researcher ensure that the results were accurate and reliable.

Summary of Research Method

In summary in the research method, this research focused on the effects of advanced technology in the business sector, with emerging technology being developed at an accelerated rate, causing a gap in leadership skills compared to the speed of technological advancement. Qualitative research is a powerful tool that enables researchers to gain deeper insight into individuals' and groups' complex motivations, values, and perspectives. Business leaders need to understand the impact of technology on their business sector so their businesses can adapt to the constant technological changes, maintain market share, and drive future opportunities. Bailey (2022) noted three areas where emerging technology is affecting organizations that include: (a) emerging technology is increasingly autonomous and intelligent with the ability to supplement human cognition; (b) increased backend analytics that create greater reach of tracking, monitoring, deciphering; and (c) directing the behaviors of individuals and groups.

The researcher's role in this kind of research is critical. This researcher interpreted collected data meaningfully, synthesize findings, and establish meaning from seemingly unrelated information. Flexible design qualitative research also allows for in-depth exploration of topics beyond surface-level understanding. It is often used to uncover new perspectives, identify trends, and understand the context within which individuals and groups operate. Ultimately, this qualitative research on the impact of the potential technology skills gap between managing manufacturing companies in the greater Cleveland area of Ohio, resulting in lost revenue and business opportunities.

Participants

The participants of this study were senior organizational leaders, middle-management leaders, and front-line contributors in Ohio's manufacturing business in the greater Cleveland

metropolitan area. Senior organizational leaders provide strategic direction over a business and guidance for training and technology. Connected to the specific problem, senior leaders are the center of leadership, owning the organizational vision and decision-making regarding technology implementation and preparing their organization and leaders to handle advanced technology. The criteria for a senior organizational leader would be the direct owner of the firm or their direct delegated leader, who is granted vision creation and final budget authority.

Middle-management leaders and managers were participants in this study as they were the leaders responsible for the execution of the vision and objectives of the senior organizational leader. They will have some situational input to the vision and budget, but do not own the final decision in the organizational direction. The participants in this category were any people's influencer role that impacts the organization. These middle-management participants were manufacturing managers, operations managers, human resource managers, training managers, or quality control managers. Middle-management leaders are connected to specific problems as they are transformational leaders who identify the necessity of change and motivate front-line managers and followers to transcend their self-interests for the good of the team and organization (Farahnak et al., 2020). This group of middle-management leaders as actors play a direct role in executing the organization's strategic vision and provide day-to-day guidance to front-line supervisors and individual contributors who perform the work related to technology adaptation.

Front-line contributors were participants within the organization who executed tactics under the direction of management to accomplish strategic objectives. In this study, front-line contributors were defined as individual contributors or supervisors. These were manufacturing operators on the shop floor, quality technicians, direct trainers, or front-line supervisors. Front-

line contributors directly connect to the problem as they are responsible for organizational production.

Population and Sampling

The population is vital in conducting research in any field and is the individuals studied to answer the research question. The research population can consist of a minor, a targeted group, or a larger and more diverse sample size (Creswell & Poth, 2018). Stratton (2021) noted that collecting data from an entire population is impossible when conducting research. In the context of this research, which is looking to identify potential gaps in leadership skills compared to the speed of technological advancement in Ohio's greater Cleveland metropolitan area manufacturing companies, it is not plausible to contact every business leader. When the entire population cannot participate in the study, sampling is employed to gather data representing the target population (Stratton, 2021). In flexible design, qualitative research sampling is essential to modern research to produce good research with quality results, limit potential researcher biases, and accurately represent the target population (Adebayo & Ackers, 2021). The selected participants preferred a deeper understanding of the individual perception of expanding the understanding of why businesses and leaders struggle to lead during a time of quickly advancing technology, resulting in lost revenue and business opportunities.

Discussion of Population

Casteel and Bridier (2021) defined a population as the unit of measure for research, which is the fundamental aspect of analysis. Once the unit of measure is established, the population parameters must be established. Population parameters are integral to understanding business dynamics. It helps inform our decisions about using available resources, plan research events, and understand the complexities of the entire population (Casteel & Bridier, 2021).

Populations in research studies are the individuals, groups, and organizations that will assist in developing a greater understanding of the phenomena (Andrade, 2021). Casteel and Bridier (2021) continued to define populations as the boundaries of the study's scope, providing the reader with an environmental and contextual frame of reference. Business research population characteristics are essential to consider the geographic, sector demographic, organizational makeup, and any other unique factors that may influence their research results.

Robson and McCartan (2016) noted that population parameters are needed as part of the early decision in the research design. These parameters are essential to review research questions to evaluate if the questions need to be modified based on a population. Knowing these details can help ensure this business study reaches its desired outcomes and avoid bias or misrepresentation in its findings. The population of this study were senior business leaders, middle-line managers, and front-line contributors of manufacturing businesses in Ohio's greater Cleveland metropolitan area. Manufacturing businesses that were considered were any organization producing a product without focusing on the business sector.

The population parameter of senior business leaders, middle-line managers, and front-line contributors of manufacturing businesses in Ohio's greater Cleveland metropolitan area in this study were appropriate for this research and assisted in determining the driving factors behind the leadership skills gap and see if specific actions and behavior leaders can do to be more prepared to manage the effects of advanced technology. The population supported answering the research questions that explored the problem concerning business leadership's inability to be prepared to manage emerging technology. The research questions looked for the balance between organizational and individual responsibility in reducing the effects of emerging technology on an organization. The more significant problem of the leadership skills gap was

explored, working to define actions and behaviors that can be used to mitigate the effects of unpreparedness in advanced technology. The size of the eligible population was desired to be between nine and 12 manufacturing firms in total, with maximized leadership participation. The population of a qualitative design helps to understand the phenomenon through the participants' lived experiences. It provides a richly textured understanding of the phenomenon, which will help to view how technology inevitability will continue to advance and affect business leadership (Mthuli et al., 2022).

In order to ensure accuracy in business research sampling, researchers need to develop an appropriate design to select the sample size that best represents the overall targeted population and select the most suitable subjects. There are many sampling methods, including purposeful, convenience, random, stratified, cluster, systematic, or quota sampling (Creswell & Poth, 2018). This research was based on purposeful sampling and secondarily used convenience planning. Creswell and Poth (2018) noted that purposeful sampling involves selecting individuals or groups to help learn and understand the phenomenon. Purposeful sampling research was used to select the manufacturing firms, senior leaders, and middle-line managers included in this study.

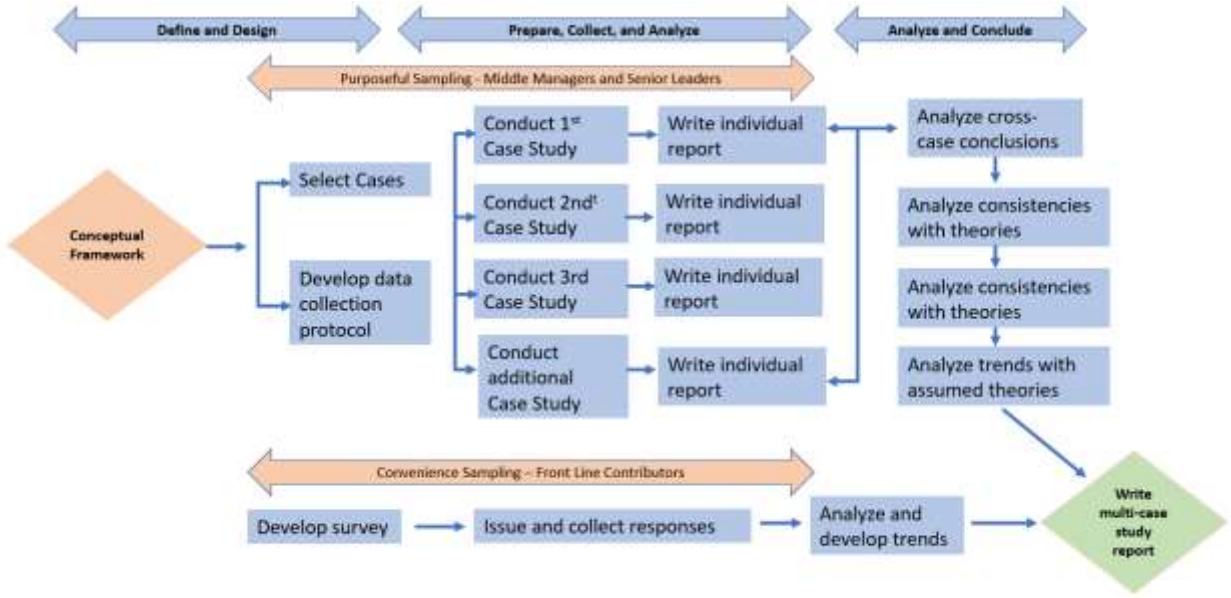
Vasileiou et al. (2018) noted that purposeful sampling in qualitative research provides information-rich data because organizations are selected based on their ability to provide rich textured information relevant to the phenomenon. A key aspect was senior leaders of those organizations had to allow their businesses to be part of the research study. Once the senior leaders agree to the study, the goal was to conduct a survey followed by face-to-face interviews with the senior leaders and middle-line managers.

Convenience planning was utilized in two folds. A simple survey was developed with less than 10 questions distributed to the front-line workers of the selected firms with the goal of

maximum participation to gain a bottom-up perspective. The ultimate goal was to analyze both a top-down and bottom-up perspective on leadership ability to lead during technology, looking to identify specific actions and behaviors leaders can do to be more prepared to manage the effects of advanced technology. This research was based on purposeful sampling and used convenience sampling to determine the research objectives and the studied target population. Figure 2 shows the flow of sampling related to this case study research.

Figure 2

Sampling Method Flowchart



Discussion of Sampling

Creswell and Poth (2018) noted many sampling methods, including purposeful, convenience, random, stratified, cluster, systematic, or quota sampling. These other forms of sampling, such as random, stratified, cluster, systematic, or quota sampling, can be helpful in certain situations; however, they may not accurately represent the population needed to accomplish this research. Furthermore, these methods do not allow for any control over who is included in the sample group, making it challenging to ensure that all relevant perspectives are

represented. The selected methods, purposeful sampling, and second convenience planning ultimately provided this research with more accurate and meaningful results.

This research was accomplished primarily using purposeful sampling because it involves deliberately selecting participants based on specific criteria, such as their experience with the studied topic or demographic characteristics. In the case of this research, leaders in manufacturing businesses in Ohio's greater Cleveland metropolitan area firms were selected as participants based on the businesses they lead and the geographic location of those businesses. The three tiers of participants were senior organizational leaders, middle-management leaders, and front-line workers.

As a secondary method of sampling, this research used convenience planning, which involves selecting participants who are easily accessible, such as those near the researcher or those who have already expressed interest in participating in the study. In this case, all three tiers of participants were easily accessible and willing to complete the online survey delivered via email. These methods provided the research with an effective way to collect data from individuals who could provide valuable insights into a particular subject area. Additionally, these techniques helped to ensure that results obtained from research studies were accurate and reliable since they involved collecting information from people who possessed relevant knowledge and expertise about the topic being studied. Focusing on particular characteristics or experiences of the population allows for greater control over the sample group to ensure that all appropriate perspectives are considered to help produce reliable data, leading to more meaningful and reliable (Campbell et al., 2020).

A sample frame is a list of elements from which a statistical sample can be drawn and is used to identify the population that were studied and to ensure that all population members have

an equal chance of being included in the sample (Casteel & Bridier, 2021). Selecting an appropriate sample size for a case study can be difficult and complex, and it is vital to ensure that the sample size is adequate for the research. An accurate sample size estimation can ensure that any data collected will provide meaningful results while avoiding the unnecessary expenditure of time and resources. Creswell and Poth (2018) noted that case study research should include no more than four or five case studies in a single study. In a qualitative study, the researcher must collect data on the organizations and individuals and collect extensive detail about each site and individual (Creswell & Poth, 2018).

The standard sample size is one in which the point analysis of collected data will produce no new information and is called data saturation (Braun & Clarke, 2021). Achieving data saturation can be arduous, and when estimating sample size, researchers must consider the potential for saturation to avoid collecting unnecessary data. There is some debate on the final point in data collection to receive data saturation, but it is frequently considered the guarantee of the qualitative rigor offered by the author to the readers (Hennink & Kaiser, 2022). Qualitative case studies typically require a smaller sample size than quantitative studies due to the inherent nature of qualitative research methods. This study aimed to select a sample size that could provide sufficient data to answer their research questions while allowing further exploration.

Researchers should consider any ethical considerations when selecting a sample size, ensure that the data collected is of sufficient quality, and avoid the exploitation of participants. Determining the appropriate sample size for a case study is a complex process that requires careful consideration of the research questions and data saturation potential. It requires adequately estimating sample size and can lead to meaningful results while avoiding the unnecessary expenditure of resources. Sample size selection involves balancing the cost and time

of data collection with the accuracy and precision of results. Too small of a sample may lead to inaccurate or imprecise results, while too large may incur unnecessary costs and not bring additional value to the research.

Cobern and Adams (2020) noted that in interviewing, a researcher needs to provide sound judgment on the number of opinions represented within their sample size. For case studies, traditional wisdom is that interviews should be between 15 and 20 (Cobern & Adams, 2020). Mthuli et al. (2022) noted that Creswell (2002) suggested that five to 25 interviews are needed, while Morse (1999) suggested that six would be appropriate, and Yin (2018) noted that 25 – 50 interviews are recommended sample size for qualitative case study research. Considering those recommendations, this study's desired sample size was nine to 12 manufacturing businesses at a minimum sample size for senior business leaders. The 12 to 15 senior business leaders participating also opened up to 24 to 30 middle managers to interview. This initial assumption gained a range of 36 to 45 interviews. The current assumption was that if an organization's senior business leader was interviewed, there would be at least two middle managers to interview, with one leader focused on human resources and the other on manufacturing.

Additional data would be the front-line surveys that can be distributed at all levels of the organization. Manufacturing businesses were not formally identified for this study. Through casual conversations, businesses in the Cleveland, Ohio, area gave initial interest in participation. Through internet searches, manufacturing associations have been identified to contact in the future to seek participation from their members, including the Ohio Manufacturing Association, Christian Business Owners, Midwest Manufacturers Association, and Faith Tech. Cobern and Adams (2020) described that an excellent qualitative researcher requires good judgment in describing the situation of their study and defending value judgments and assumptions.

Determining how many subjects to interview is a valuable judgment when there will be no new opinions on the phenomenon (Cobern & Adams, 2020). The sample size referenced above was believed to provide the details needed to understand the phenomenon of advanced technology in the business sector, with emerging technology accelerated, causing a gap in leadership skills compared to the speed of technological advancement.

Summary of Population and Sampling

In summary, through case studies, this research looked at the impact of advanced technologies on business leadership. The participants of this study were senior organizational leaders, middle-management leaders, and frontline contributors in the greater Cleveland area of Ohio manufacturing business. The content of this qualitative study was limited to interviews, surveys, and observations of business leaders' understanding of the actions and behaviors of the individual leader. Since the entire population cannot participate in the study, sampling is employed to gather data representing the target population (Stratton, 2021). This research was based on purposeful sampling and secondarily used convenience planning, where purposeful sampling research was used in selecting the manufacturing firms, senior leaders, and middle-line managers in this study. Convenience sampling was used to gather data from frontline contributors related to these businesses. In closing, this research utilized the above-referenced qualitative sampling methods and included participants to understand the effects of advanced technology on business leaders' potential, causing the inability to manage advanced technology due to a skills gap.

Data Collection and Organization

The qualitative data collection method uses open-ended questions and interviews to gain insights into people's attitudes, beliefs, behaviors, and experiences (Creswell & Poth, 2018).

Roberts (2020) noted that interviews have been used to gather knowledge in various disciplines, including business, to collect data in research for decades. This type of research is used to understand how business leaders think of the effects of emerging technology on leadership. Qualitative research is essential for gaining meaningful insight into people's attitudes, beliefs, behaviors, and experiences (Creswell & Poth, 2018). By creating an effective qualitative research data collection plan, this research was conducted ethically and efficiently. This qualitative research data collection plan will result in higher-quality data and better-informed decision-making.

Data Collection Plan

Data collection is the cornerstone of good research, and a plan needs to be established upfront in the research design. The data collection plan includes gaining subject participation, ethical considerations, quality sampling of the population, data storage and security methods, and responding to issues in the field (Creswell & Poth, 2018). Creswell and Poth (2018) noted that the end state of the data collection plan is to gather quality information and answer the emerging research questions of the study. This qualitative case study utilized a data collection technique including interviews, surveys, and observations centered on participant semi-structured interviews utilizing open-ended questions to explore perceived realities. Tobi and Kampen (2018) mentioned that researchers need to be pragmatic in developing a data collection design strategy that allows the wavetops of information to be thoroughly studied and work toward a common understanding of the phenomenon. The author collected qualitative data points, including interviews, surveys, and observations of business leaders in Ohio's greater Cleveland metropolitan area businesses.

The quantitative data collected in this research was accomplished through face-to-face interviews with senior business leaders and middle-line managers. The data points that were collected were the demographics of the business's manufacturing firms, including revenue range, manufacturing sector, employees, gender, education level, age, and business longevity, to provide context on the experience of the research participants. The senior organizational leaders and middle-management leaders were interviewed with open-ended questions to explore the effects of technology on manufacturing leadership. Field notes and audio recordings were collected from the 60 to 90-minute interviews, which helped clarify any discrepancies in the field notes. The surveys delivered via emailed hyperlinks collected data points, including age, date, highest education, and years in the industry.

Instruments

Qualitative research instruments can include interviews, focus groups, observations, and surveys (Yin, 2018). Qualitative research instruments are essential for conducting studies in the social sciences. These tools allow researchers to understand better their participants and the topics they are studying. Each instrument has strengths and weaknesses that should be considered when designing a study. Interviews are one of the most commonly used qualitative research instruments, allowing researchers to ask open-ended questions and explore in-depth responses with their participants (Creswell & Poth, 2018). Utilizing a semi-structured interview guide allows the researcher to follow up with unforeseen questions that probe into participant answers and provide additional clarity of understanding. Creswell and Poth (2018) noted that interviews also have limitations, such as potential bias from the researcher or participant, which may affect results.

Researcher bias was mitigated by developing practical qualitative interview questions and protocols that support the researcher's learning but reduce the likelihood of mistakes (Roberts, 2020). A scripted interview guide was developed and supplied in Appendix A that maintains the questions and protocols to reduce bias and set the boundaries for researcher and participant interaction. Lavee and Itzchakov (2023) noted that not only is the interview guide and planning essential to develop rich data, but also that the researcher has quality listening techniques, and building rapport with the participants is critical for quality data. In doing so, the interviews with senior leaders and middle-line managers were recorded so that material were reviewed for clarity.

A survey (Appendix B) was the main instrument for collecting data from front-line workers. Senior organizational leaders and middle-line managers had the option to complete the simple nine questions survey, but that were not the primary data collection point for the organizational leaders. Yin (2018) noted that a survey of structured questions provides a different role in data collection and can be used to provide a different perspective than open-question interviews. The survey intended to gather a bottom-up view of how front-line workers view the impact of emerging technology on manufacturing leadership.

The interview guide and survey were instruments that supported the research questions to develop a balanced understanding of organizational and individual responsibility in reducing the effects of emerging technology on an organization. Kolagar et al. (2022) noted that organizational culture plays a fundamental role in successful digital transformation, and overcoming the implementation of digital transformation lies in the organizational culture. The interview guide categorized questions based on three general areas: organizational culture, organizational innovation, and COVID-19 impact. These categories helped find the balance

between organizational and individual responsibility. In the interview guide, the questions specifically looked to gain insights into the actions and behaviors of the organization's ability to be better prepared to address emerging technology. In interview question development, it was intentional to ask open-ended questions that would get the participants to discuss actions and behaviors related to what the organization is doing to prepare their leader and what attributes the organization desires in their leaders. Actions are the mechanism of doing something, whereas behavior is aligned with how a person acts (Mallpress, 2022). Mallpress' (2022) research provides a more powerful taxonomy of behavior and how it is described, categorized, analyzed, and understood.

The author examined how a business or leaders' behavior can influence leadership in managing emerging technology in their business section. The survey was emailed, texted, or distributed via flyer with an embedded hyperlink to the eight questions on a 5-point scale. It was used to get a snapshot of how their front-line workers view the organizational culture and how the organization is prepared to handle emerging technology.

Data Collection, Organization (and Process) Plan

Organizing qualitative data for research studies is a critical task that must be handled accurately and carefully. Properly organizing the data helps ensure the researcher can access all the information needed to draw meaningful conclusions from the study results. At the beginning of a data organization plan, the researcher must include the types of data gathered, including primary and secondary sources, and how they will be collected and analyzed (Robson & McCartan, 2016). Researchers should create a coding system for their qualitative data to facilitate analysis (Robson & McCartan, 2016). This process includes assigning labels or tags to different pieces of data, which can then be used to group related information and make it easier

to search for or analyze specific topics. Finally, researchers should also systematically document their findings to quickly reference later results (Creswell & Poth, 2018).

This research utilized an organized system for taking notes based on the protocols detailed in the interview guide (Appendix A). After each interview, the recording was transcribed, detailed interview notes were analyzed, and a brief memo was created after each interview. After each interview, the guide and memo were loaded into NVivo, essential in capturing all relevant information about each idea or theme encountered.

Member checking is used in qualitative research to ensure accuracy by soliciting participant feedback about one's data and interpretations (Motulsky, 2021). It involves having participants review their responses and provide feedback on whether they feel the researcher accurately captured their thoughts, feelings, and experiences (Sahakyan, 2023). The purpose of member checking is to increase the trustworthiness and credibility of findings by allowing participants to confirm that their words were correctly interpreted by the researcher (Sahakyan, 2023). Member checking can also serve as a way for researchers to gain further insight into participants' perspectives which may have been missed during initial interviews (Creswell & Poth, 2018). By engaging in this process, this research strengthened the validity of the results. In this research, the field notes were reviewed with the participant at the end of each interview to ensure that their thoughts, feelings, and experiences were captured correctly. Follow-up interviews were utilized after all interviews were completed, depending on the trends in the data that needed additional clarification.

Summary of Data Collection and Organization

In summary, this qualitative case study utilized a data collection technique centered on participant semi-structured interviews utilizing open-ended questions to explore perceived

realities. This process was appropriate as the methods developed followed the protocols of past texts and peer-reviewed articles. Creswell and Poth (2018) highlighted seven areas in data collection activities that help the researcher conduct good information to support answering the research questions. These seven areas are locating participants, gaining access and rapport, sampling purposefully, collecting data, recording information, reducing field issues, and storing data securely (Creswell & Poth, 2018). The interview guides and surveys and the development of rigid protocols helped collect data and lead to the organization in NVivo. This research utilized an organized system for taking notes based on the protocols detailed in the interview guide (Appendix A).

Data Analysis

Qualitative research data analysis is a complex process that requires careful planning and execution. In an effective data analysis plan, the researcher risks making mistakes in interpreting the data or missing essential insights. To ensure successful qualitative research data analysis in this study, the researcher will follow best practices, including developing clear objectives for the study, creating a comprehensive coding scheme, using multiple methods of analysis, engaging in iterative review and revision processes, and documenting each step of the process (Yin, 2018). An established, effective plan will produce meaningful results following these best practices.

Emergent Ideas

Qualitative research data analysis is a complex process that requires careful consideration of emergent ideas and themes. Keeping track of the various insights and connections made during the analysis process will be challenging without proper documentation. Lack of proper documentation can lead to confusion when interpreting or explaining findings from qualitative research studies. The process for memoing and documenting emergent ideas follows the

guidance provided by Creswell and Poth (2018). This guidance includes immersing oneself in the details and understanding the interview before breaking it into parts (Creswell & Poth, 2018). Creswell and Poth (2018) continued noting that they should read, reflect, play, and explore strategies in the data while making notes or memos in the margins of the field notes to help highlight trends among the interview subjects. An area of interest to this study was listening to aspects of the leadership theories utilized by business leaders in their management of advanced technology.

Coding Themes

Robson and McCartan (2016) noted that qualitative data could become overwhelming quickly, and the researcher needs to find ways to make it manageable. Good data housekeeping in research at the earliest point is the best way for a researcher to stay on track (Robson & McCartan, 2016). Qualitative data analysis is an essential part of this research project. It involves coding and categorizing the collected data to identify patterns, trends, and relationships between variables. At the same time, analyzing data and coding themes are helpful for quickly referencing specific ideas or themes that come up during the process (Creswell & Poth, 2018).

Coding was assigned via the software program NVivo. NVivo is a powerful software tool designed specifically for qualitative research projects. The face-to-face interviews were transcribed using online translation software, auto coded by NVivo, and manually coded by the researcher to verify and define interview themes. With NVivo, researchers can quickly code large amounts of qualitative data more accurately than manual methods and use sophisticated analytics tools to uncover hidden insights in their datasets.

Once complete, the survey in Appendix B was also consolidated with the results, and the final spreadsheet containing the data was uploaded into NVivo. In addition to coding, Robson

and McCartan (2016) noted that the following coding groups the initial codes into more minor themes. From the start of the interviews, memo summaries were created, and key themes were grouped, uploaded into the NVivo program, and coded, minimizing any missed connections or overlooked details.

Interpretations

In qualitative research, interpretation involves abstracting beyond the codes and themes to the macro meaning of the data (Creswell & Poth, 2018). Yin (2018) stated that the point of case study collection is not just a mechanical exercise of recording data but a process that allows the researcher to interpret the data and act like a detective determining insights. Jain and Ajmera (2021) discussed that the author should clearly and transparently explain their personal and theoretical understanding of the phenomena so that the readers can follow the direction of the research. Jain and Ajmera (2021) noted that readers should be able to follow the sequence of the thoughts and interpretations made by the researcher in the analysis and have a clear description of the tools used.

Data Representation

For an accurate and effective representation of qualitative research data, it is essential to follow best practices when analyzing the information collected from interviews, surveys, and observations. This research included visualizations with tables, graphs, and word bubbles. The goal was to organize the information into meaningful categories that developed precise definitions for each category, ensured accuracy by double-checking all calculations, and utilized software tools to facilitate efficient analysis. Additionally, researchers should be mindful of ethical considerations when collecting and representing sensitive information about study participants. By following these best practices for effectively representing qualitative research

data, researchers can ensure they accurately interpret their results while protecting participant privacy rights.

Analysis for Triangulation

Future research to address the effects of a gap in leadership skills compared to the rate of technological advancement will regard triangulation as a research mindset promoting methodological diversity that will lead to qualitative scientific discoveries. Nielsen et al. (2020) related methodological diversity to the necessary rigor in research to reduce any biases, errors, or limitations experienced in a single data collection form. Denzin (2017) documented four types of triangulation: data triangulation, observer triangulation, methodological triangulation, and theory triangulation. Data triangulation uses multiple methods for data collection, including observation, interviews, surveys, and document review (Robson & McCartan, 2016). Robson and McCartan (2016) noted that observer triangulation is a method where one observer supports the triangulation, and methodological triangulation combines quantitative and qualitative approaches.

Theory triangulation uses multiple theories or perspectives. For this research, observer and methodological triangulation will not be used in this study and will be rejected from this research. Methodological triangulation is the convergence of multiple methods upon a single conclusion to support a better conclusion (Heesen et al., 2019). Multiple methods may support a better conclusion, but this process adds unnecessary complexity, time, and resources that will bring enough value.

For this research, two types of triangulations were used: data and theory. Multiple data sources, including observations, interviews, audiovisual material, and documentation, lead to methodological rigor established by the researcher setting standards for the research process,

including the study's data collection, analysis, and reporting (Robson & McCartan, 2016). Data and theory triangulation were sufficient for this study and provided a greater understanding of the effects of emerging technology on business leadership in Ohio's greater Cleveland metropolitan area manufacturing sector.

Data triangulation strengthens construct validity in case study research by using multiple data sources and provides different measures of the phenomenon (Farquhar et al., 2020). Theory triangulation was used to help understand the leadership skills gap of business leaders through the lens of existing management and leadership theories. Denzin (2017) outlined three steps for theoretical triangulation, which consist of (a) defining the theoretical perspectives, (b) data analysis through a theoretical lens, and (c) theory-building account with sensitivity to fresh theoretical insights.

Qualitative researchers strive for a greater understanding and deep knowledge structure by working with participants, readers, and themselves to obtain detailed meanings to research questions (Creswell & Poth, 2018). In this qualitative research, it was essential to show the credibility of the research methods and have multiple means to validate the data. Triangulation is the avenue to address both validity and reliability through the corroboration through the convergence of sources through various interpretations, perceptions, and experiences (Farquhar et al., 2020). Qualitative research methods were interviews, surveys, and observations of business leaders in Ohio's greater Cleveland metropolitan area manufacturing businesses.

This data validation was accomplished through triangulation, a multi-level approach that builds trust with reviewers on the transparency of the research presented. Methodological rigor is essential for the researcher to set standards for the research process, including how data will be collected, data analysis and storage, and reporting of the study (Nielsen et al., 2020).

Quantitative methods used in this research were the demographics of the business's manufacturing firms, including revenue, employees, gender composition of business leaders, and business longevity, to provide context on the experience of the research participants. Establishing the nature of the study leads to providing the conceptual framework of this study.

Summary of Data Analysis

In summary of data collection and organization, the data analysis for this qualitative research included a detailed plan and execution that minimizes the risk of making mistakes in interpreting the data or missing essential insights. To ensure successful qualitative research data analysis in this study, the researcher followed best practices, including developing clear objectives for the study, creating a comprehensive coding scheme, using multiple methods of analysis, engaging in iterative review and revision processes, and documenting each step of the process (Yin, 2018). Establishing an effective plan will lead to meaningful results by following these best practices.

Reliability and Validity

According to Spiers et al. (2018), verification strategies for reliability and validity in qualitative research have been among the most downloaded articles. Qualitative and quantitative comparisons in constructs ensure that the data and the methods to collect, retain, and analyze the data are credible. In the early 1950s, quantitative research prevailed, viewed as a valid scientific method in the theory of science, and it was thought to be the sole means of credible research (Huttunen & Kakkori, 2020). Over time, qualitative research gained popularity, but the big difference is how the research is viewed as credible.

Reliability

Reliability refers to the extent to which a measure or instrument produces similar results when used repeatedly on different occasions; in other words, reliability measures how dependable a researcher's findings are over time (Hedge, 2021). Hedge (2021) assessed reliability as the ratio estimate of signal (i.e., variation in valid scores) to noise (i.e., error) by examining the consistency of participants' scores over some form of repeated measurement. Reliability is not a property of tasks or procedures but rather a property of a set of scores obtained from a given population (Hedge, 2021). Hedge (2021) noted that this refers to the consistency and accuracy with which an instrument measures something across different occasions or conditions. It can then be assumed to have good reliability based on consistency, and a lack of consistency leads to further refinement before it can be considered reliable enough for use in research.

Creswell and Poth (2018) noted that reliability can be enhanced when the researcher takes detailed field notes, employs quality recording devices, and transcribes digital files. Coleman (2021) noted that it is difficult in a qualitative study to demonstrate reliability, so it is essential to be transparent with the data and stick to rigorous control measures to maintain consistency. Following the strict data protocols outlined in Appendix C helped improve the reliability of this work.

Validity

For qualitative research to be considered reliable, it must also have validity. The study accurately reflects what it was designed to measure or assess. Validity is an essential component of qualitative research. It refers to the accuracy and reliability of results determined by the methods used to collect and analyze data. Validity involves assessing whether the research

design is appropriate for answering the questions posed by the study's research questions. To achieve validity in qualitative studies, researchers should clearly define their objectives before beginning their work and establish theories and frameworks related to their topic area when analyzing their findings to draw meaningful conclusions about them (Yin, 2018). Qualitative research is viewed as credible not because of the measurable results but in the efforts of the author to implement valuation and reliability aspects to represent the transparency of the research.

Strategies for validity have been presented to maximize transparency in this research and provide accurate results. Creswell and Poth (2018) highlighted work from Whittemore et al. (2001), where validation strategies should be designed into three lenses: the researcher, the participant, and the reader/reviewer. Of those three lenses, nine strategies are identified to improve research validation. From the researcher lens perspective, corroborating evidence through triangulation, discovering a negative case analysis or disconfirming evidence, and clarifying researcher bias or engaging in reflexivity can improve the accuracy of the research (Creswell & Poth, 2018). From the participant's lens, the researcher can improve validation through member checking, complex engagement, persistent observations in the field, and collaborating with the participants (Creswell & Poth, 2018). Creswell and Poth (2018) noted that from the reader's or reviewer's lens, improvement in validation could be found by enabling external audits, generating rich and detailed descriptions, and including peer review and data debriefing to improve research transparency. Validation in research should continue and evolve, utilizing both traditional and contemporary perspectives as an essential piece for informing the work of qualitative researchers and readers of qualitative research.

This research used purposeful qualitative analysis to organize collected data into categories, sub-categories, themes supporting the study's assertions, and thematic saturation. Thematic saturation occurs when further analysis reveals no additional meaningful themes (Lowe et al., 2018). This study achieved thematic saturation due to the sufficiency of data collected from interviews, surveys, and observations, leading to meaningful themes supporting the study's assertions and conclusions. NVivo was used to document saturation, where initial codes were refined and focused on reaching synthesis between existing articles and the collected data. This qualitative multi-case study established trustworthiness using thematic saturation and data triangulation strategies, including reliability and validity. Establishing the reliability and dependability of the study occurred by providing a documented audit trail of data collection and triangulated sequenced data analysis.

Bracketing

Bracketing is an idea in which the researcher sets aside all of their personal preconceived experiences so that they can best understand the participants' experiences in the study (Creswell & Poth, 2018). Bracketing is an essential technique for researchers when conducting qualitative research and helps ensure that the researcher remains aware of their beliefs and assumptions, not bias their results. Esmene and Kirsop-Taylor (2021) noted that the studied context influences bracketing related to the researcher. However, bracketing will allow the researcher to take a holistic approach to data collection and analysis, allowing them to consider all possible sources of information before drawing any conclusions (Esmene & Kirsop-Taylor, 2021).

One key benefit of bracketing is that it encourages critical reflection on the researcher's part and can be applied to explore and understand the recursive nature of structure within an organization (Kennedy et al., 2021). The recursive nature of the structure of an organization is

the concept that an organization is made up of smaller parts that are themselves made up of still smaller parts (Kennedy et al., 2021). The notion of recursive organizational structure is a powerful tool for understanding how organizations evolve and how their structures interact with one another. By taking time from data collection or analysis to reflect on personal values and biases, the researcher was able to identify potential areas of bias in their work that may otherwise have gone unnoticed. This process also helps researchers gain insight into how their perspectives might influence what they observe during fieldwork or make sense of collected data. In this way, bracketing can be seen as a form of methodological self-awareness that ensures the researcher's work is rigorous and valid, taking into account personal history, social aspects, and the pre-understandings of the researcher (Dörfler & Stierand, 2021).

Summary of Reliability and Validity

This section discussed the importance of reliability, validity, and bracketing to increase the acceptance of the presented research. Following the strict data protocols outlined in Appendix C helped improve the reliability of this work. Validation in this study utilized both traditional and contemporary perspectives as an essential piece for informing the work of qualitative researchers and readers of qualitative research. Bracketing encourages critical reflection on the researcher's part and can be applied to explore and understand the recursive nature of organizational structure (Kennedy et al., 2021). Technology change is in many sectors, and the rate of advances could differ based on the industry, defining a complete understanding of the potential problem.

Summary of Section 2

In summary, through case studies, this research looked at the impact of advanced technologies on business leadership. This study's participants were senior organizational leaders,

middle-management leaders, and front-line contributors in Ohio's greater Cleveland metropolitan area manufacturing businesses. The content of this qualitative study was limited to interviews, surveys, and observations of business leaders' understanding of the actions and behaviors of the individual leader. Since the entire population cannot participate in the study, sampling is employed to gather data representing the target population (Stratton, 2021).

This research was based on purposeful sampling and secondarily used convenience planning to select the manufacturing firms, senior leaders, and middle-line managers in this study. Convenience sampling will be used to gather data from front-line contributors related to these businesses. In closing, this research utilized the above-referenced qualitative sampling methods and included participants to understand the effects of advanced technology on business leaders' potential, causing the inability to manage advanced technology due to a skills gap.

In conclusion, this research focused on the effects of advanced technology on the business sector, with emerging technology being developed at an accelerated rate, causing a gap in leadership skills compared to the speed of technological advancement. Specifically, the problem looked at this phenomenon related to the skills gap of business leaders managing manufacturing companies in Ohio's greater Cleveland metropolitan area, resulting in lost revenue and business opportunities. It was accomplished through case studies examining the impact of advanced technologies on business leadership. To the best of the researcher's knowledge, this study was the first to analyze the impact of technology on leadership in manufacturing businesses in Ohio's greater Cleveland metropolitan area. The research parameters were a multiple case study design that conducted interviews, surveys, and observations of the selected participants at Ohio's greater Cleveland metropolitan area manufacturing firms to determine the impact of advanced technology on business leaders.

Rossini et al. (2021) wrote about the impact of digital transformation on 19 Italian companies, suggesting that future studies have a different sample size, a different set of researched companies, and in additional countries. The objective was to explore a more disaggregated categorization of Industry 4.0, further differentiating companies' digital transformation according to their maturity levels. Another approach was the study by Zeike et al. (2019), which looked at the association between digital leadership skills and well-being among managers. The idea was that a leader's well-being was based on their digital leadership skills, and if a leader was deficient, it would cause stress due to the inability to lead. Zeike et al. (2019) suggested that future studies should examine how improving leadership skills and gaining skill competency will decrease leader stress.

Through its flexible design, this study may continue Zeike et al.'s (2019) thoughts based on the premise that improved skill competency may reduce stress, potentially making an organization more effective. Molino et al. (2021) studied technology acceptance based on self-reported data and recommended that future studies include other objective data from peers or supervisors. Henderikx and Stoffers' (2022) research focused on middle managers as they are traditionally the leaders that lead digital transformation. Henderikx and Stoffers' (2022) recommendation for future work was that other levels of management should be considered when looking at the impact of digital transformation on leadership.

This research differs from the Henderikx and Stoffers (2022) and Molino et al. (2021) studies as the participants were three layers in the research company conducted through interviews led by the researchers and self-reported survey data. The conceptual framework for this study was to reduce the leadership skills set gap; a leader needs to understand transformational leadership, adaptive leadership theory, and situational leadership approach.

These three principles create the need for the organization to change due to the changing business environment.

Section 3: Application to Professional Practice and Implications for Change

Overview of the Study

This case study research looked at the impact of advanced technologies on business leadership—digital transformation reshaping every aspect of the business world, including the people, processes, and platforms. Artificial intelligence, machine learning, and big data provide mountains of data businesses must manage. Nevertheless, it is becoming evident that there is a leadership skills gap compared to the rate of technological advances. The general problem addressed is business leaders' inability to manage advanced technology due to a skills gap, resulting in lost revenue and business opportunities. Further refining this problem to a more specific scope delimits precisely to business leaders in Ohio's greater Cleveland metropolitan area manufacturing companies.

Cleveland, Ohio, metropolitan area was selected as the specific location due to the primary location of the researcher and their appreciation of the history of Cleveland, Ohio, being a lifelong resident of the area. Ohio's greater Cleveland metropolitan area became a pivotal manufacturing center during the post-Civil War Industrial Revolution. It was one of the fastest-growing cities in the American manufacturing belt regarding population and manufacturing employment (Healey, 2014). Heavy industries flourished with the strategic location along Lake Erie and access to an abundant supply of raw materials (Fogarty et al., 2002). Cleveland rapidly developed into a manufacturing powerhouse. Manufacturing in the region emphasized materials processing and the production of more complex and precisely designed goods, ranging from auto parts to automobile assembly, pumps, office equipment, and household appliances.

The flourishing of the past for this region changed as high-tech growth was limited and unevenly distributed to other sections of the country (Rotman, 2023). The American

manufacturing belt began to be called the Rust Belt, and other sections of the country's middle kept getting rustier. Even though the United States had impressive advances in artificial intelligence and other areas of high tech, the nation’s prosperity has largely benefited people in only a few regions, including San Francisco, Seattle, and Boston, which are booming. At the same time, the rest of the country suffers (Rotman, 2023). Therefore, Ohio's strong manufacturing history, presence, and heavy reliance on industry make it a relevant location for conducting this study on the effects of technology on leadership in the manufacturing sector.

In adapting to the rapid technological advancements within the manufacturing sector, senior leaders and middle managers must engage in proactive behaviors and actions to stay ahead, cultivating a culture of continuous learning and innovation. These proactive behaviors and actions involve keeping abreast of technological trends through ongoing education and training and fostering an environment where experimentation and risk-taking are encouraged. The participants of this study were senior organizational leaders, middle-management leaders, and front-line contributors in Ohio's manufacturing business in the greater Cleveland metropolitan area.

The researcher conducted semi-structured interviews with senior organizational leaders and middle-management leaders. Meanwhile, front-line contractors completed a simple online survey. Face-to-face interviews were conducted with 18 individuals representing 13 different manufacturing companies ranging in products from food and beverage, aviation components, contract metal machining, large format plastic products, specialty chemicals, automotive, and electrical components. Ten middle managers and eight senior leaders were interviewed for this research.

An interview guide (Appendix A) was used with open-ended questions to gain insights into the problems and issues faced in manufacturing related to technology's impact on business leaders and the actions and behaviors an organization can develop to be better prepared to address emerging technology. Utilizing a semi-structured interview guide allowed the researcher to follow up with unforeseen questions that probed into participant answers and provided additional clarity of understanding. In interview question development, it was intentional to ask open-ended questions that would get the participants to discuss current issues faced in their industry, the actions and behaviors the organization was doing to prepare their leader, and what attributed the organization desires in their leaders. The interview guide categorized questions based on three general areas: organizational culture, organizational innovation, and COVID-19 impact.

A survey (Appendix B) was used as the main instrument for collecting data from front-line workers. Senior organizational leaders and middle-line managers had the option to complete the simple nine-question survey, but that was not the primary data collection point for the organizational leaders. The research examined how a business's or leaders' actions or behavior can influence leadership in managing emerging technology in their business section.

Presentations of Findings

Themes Discovered

The manufacturing sector has always been a cornerstone of Cleveland, Ohio's economy. However, the manufacturing landscape has changed with the rapid advancement of technology. Automation, artificial intelligence, the Internet of Things, and other technological innovations are no longer optional but essential for maintaining competitiveness. Despite these advancements, many leaders in Cleveland's manufacturing sector struggle to keep pace with

technological changes. The research explored multiple themes surrounding the impact of technology on leadership within manufacturing firms in the greater Cleveland region of Ohio. The initial assumption was that businesses needed to move quickly to address the change in the business environment due to artificial intelligence and advanced technology.

The first part of the themes section addressed the research data collected from the face-to-face interviews with senior leaders and middle managers. Following that was a discussion on the online survey that individual contributors completed. This research initially assumed that most business leaders today did not have the leadership skills to manage and lead their teams through emerging technology. However, post-interviews, it became clear that this assumption was too bold. The leaders interviewed demonstrated a blend of technical and leadership skills that they were using to guide their firms into the future. Due to advanced and emerging technology, the speed of change in their business segments was more segment-dependent than a blanket situation overall in manufacturing. Those interviewed contained both skill sets, but what became apparent across all interviews was the challenges they faced in striking the right balance of skillsets to manage change between leadership and technical skills within themselves and their staff.

Qualitative data analysis was an essential and thorough part of this research project. After the interviews, the collected data were meticulously categorized to identify patterns, trends, and relationships between variables. Post-interview digital recordings were uploaded into a cloud-based translation service and converted into an MS Word file, which the researcher and interviewee reviewed for accuracy. Once accuracy was validated, the researcher summarized themes from the interview session and uploaded them to NVivo for final coding. Coding was conducted in two phases: an initial phase and a final phase. The initial phase coding consisted of five categories: (1) initial, (2) communication, (3) development, (4) engagement, and (5)

leadership with a total of 328 points documented. The final coding phase included refinement to 23 specific categories and 418 interview points documented. These 23 codes coincided with the three areas of the interview guide: organizational culture, organizational innovation, and COVID-19. Final codes and their tie to the interview guide section are listed in Table 1, providing a comprehensive overview of the research process and findings.

Table 1

Final Codes

#	Description	Category	#	Description	Category
1	Communicating Expectations from Leadership	Culture	13	Competitive Advantage	Innovation
2	Culture	Culture	14	Core Values	Innovation
3	Developing People	Culture	15	Driving Technology	Innovation
4	Development	Culture	16	Driving Technology Change	Innovation
5	Employee Engagement	Culture	17	ERP	Innovation
6	Face to Face	Culture	18	Gamification	Innovation
7	Hiring Attributes and Behaviors	Culture	19	Issues Caused by Technology	Innovation
8	Leadership Syles and Points	Culture	20	Labor Issues	Innovation
9	Private Equity	Culture	21	Metrics	Innovation

#	Description	Category	#	Description	Category
10	Private Owners Direction	Culture	22	More of Less Complex	Innovation
11	Benefits of Technology	Innovation	23	COVID	COVID
12	Changes Caused by Technology	Innovation			

Prominent multi-faceted themes were discovered, and consistent issues and/or problems were identified across all manufacturing businesses. In addition, trended themes related to actions and behaviors that leaders and businesses can use to be more successful in the short and long term were documented throughout the interview coding. The themes identified in the research illustrate the impact of technology on leadership within manufacturing firms, highlighting both opportunities and challenges that leaders must navigate in the digital age. As technology continues to evolve and advance, it is essential for leaders to not only adapt to the situation but also find the balance of technology and how to leverage it to make the most significant impact on their business.

Across all interviews, coded comments were grouped into problems or issues and then into solutions for the identified problems or issues. Coded comments related to problems or issues included labor issues and desired hiring attributes, issues/changes caused by technology, and private equity. In total, 64 comments were coded, equaling 15.6% related to labor issues and desired hiring attributes, issues/changes caused by technology, and private equity. Sixty-four percent (64%) of the comments coded can be bucketed into these four themes, including employee engagement, communicating expectations from leadership, employee development, and driving technology. The remaining 10 codes totaled 20% and touched on other aspects of the

impact of technology on their businesses. Aspects of those secondary themes supported the primary themes and were incorporated into the primary themes.

This study's desired sample size was nine to 12 manufacturing businesses, with a minimum sample size for senior business leaders. The initial assumption to reach data saturation was 12 to 15 senior business leaders and 24 to 30 middle managers, with interviews ranging from 36 to 45. The original assumption was that if an organization's senior business leader is interviewed, there would be at least two middle managers to interview, with one leader focused on human resources and the other on manufacturing. That assumption was false in that only two businesses allowed the researcher to interview more than one person within the organization. Through casual conversations, businesses in the Cleveland, Ohio, area gave initial interest in participation. However, based on the consistency of the data presented in the Themes Discovered, the researcher believed that data saturation was achieved due to the alignment and consistency of participant answers.

These issues were also consistent across all manufacturing businesses regardless of the sector, whether independently owned, private equity owned, or massive global corporations. An Initial assumption was that a significant skill gap related to the technology would impact the leader's management and leadership approach. The interesting thing found in these semi-structured interviews was that the leaders of these firms spent much more time discussing the actions and behaviors to address the problem versus focusing solely on problems or issues. The interviewees outlined their views of technology's impact on their leadership, businesses, and the associated problems and then moved the discussion to their views of solutions to said problems.

The biggest addressed problem was finding and retaining workers was consistent across all interviews. All 18 Interviews representing 13 businesses stated that labor availability is one of

their main concerns going forward, creating the most significant need for advanced technology. Fewer people are pursuing careers in manufacturing production roles as individual contributors, creating the need for technology that offsets the smaller labor pool. Interview #18 discussed the limited number of people willing to do highly repetitive manual labor generally associated with manufacturing work. They referenced the societal influence that conditions people to work in an office or remote setting on computers, which culturally makes factory production work unattractive. In interviews #3, #5, #11, and #12, all business owners brought up that the inability to find willing workers is the main reason they are pursuing advanced technology and more automated machines in their manufacturing process. The standard thought was that new technology needs to be automated to the point where one person can run multiple machines simultaneously, increasing output.

Across the board, all businesses were focusing on improving the interface of their machines to make them more user-friendly and match the electronic interfaces of today's consumer products. Interviews #7, #8, #10, and #17 were all from large global companies with a presence in Cleveland, Ohio, and all noted the importance of technology in offsetting the labor shortage. Interview #18 was an engineering manager and discussed how most of his capital projects were focused on automation to increase production in the long term due to the anticipated continued difficulties in hiring.

The need for technology is to produce more products with fewer people or improve the interface so it is easier to train new people as they are hired. Interview owners #3 and #5, who took over their family business, discussed times when sales volume increases required production to increase. A business could hire more people, use overtime, and run machines longer to support increased volumes, but times are different. Enough workers cannot be hired,

and the workers willing to work are not willing to work the amount of overtime that those in the past did. It creates a quagmire for this business in terms of maintaining or increasing production.

Both plant managers interviewed, interviews #7 and #16, shared that their plants historically brought in temporary workers through an agency for a specific period before hiring full-time. If the temporary workers built trust and showed reliability, they would become full-time employees with the company. As work increases, a business can always contract more workers through a temporary agency to fill the void in the short term. That is no longer the case, and there is no labor pool for temporary workers willing to do repetitive manufacturing-type work. Interview #16 was new to their current firm but mentioned that they phased out temporary agency workers in his previous two companies in favor of only direct hire. Interview #16 continued discussing how hard it is to hire people externally and that their focus is developing the people they have and providing them with an actual career path. More on developing people will be discussed later in this section.

They continued that the inability to hire current generational workers, coupled with the retiring of the baby boomer generation and their decades of experience, is also creating another type of labor issue.

> It is not going to be like this forever. We have got historically low unemployment, but then we also have this kind of massive generational change with the boomers retiring, and so we have got a ton of institutional knowledge that's just going away that we don't really have a way to capture. But that's – it's going to be several years of that happening, and then we will probably never see that again in our lifetime. (Personal Interview #16, May 1, 2024)

Interview #18 is an engineering manager for a huge global company, noted that:

> There is a limited people willing to do, that will do high repetitive manual labor is very few and far between anymore. And even if you get a good one, the next challenge is obviously retention. Retention has been horrible, and not just for us, because we actually have a good brand name and everything. (Personal Interview #18, May 14, 2024)

Hiring and retention were also highlighted in interview #16. They discussed the difficulties in externally hiring from the firm, where the company is looking for employee engagement through individual development programs to leverage the retention of current employees. In interviews, #2, #3, #5, #11, and #12 were all owners of custom metal fabrication businesses who took over the business from their families. All five business owners noted that moving to advanced technology to increase productivity is more important to offset the difficulties of getting new generations into manufacturing. The new technology needs to produce more products to offset labor shortages.

Breaking from past processes and technology leads to another labor-related issue. Communicating expectations across a multi-generation workforce creates labor issues in many manufacturing businesses. All five owners historically offered unlimited overtime, and most employees took advantage of this option to make as much money as possible for their families. They all noted that the younger generations do not want to work all these hours and focus on work-life balance. Interview #17, a procurement manager for a large chemical company, stated that the younger generation focuses on work-life balance, their most significant personal challenge in the workforce. Interview #2 led the conversation to the generational difference in workplace motivators, concluding that the "biggest change in leadership is how to motivate" (Personal Interview #3, March 4, 2024).

In interviews #9, #10, and #13, middle managers also commented on workers' retention as they were on the floor working on production or maintenance. Interview #13 noted that employee turnover at their firm was in months because of the instability of management and demanding work. They have been at that firm for 5 years and do not feel that there is a career path, as internal employees are passed over for expanded leadership roles in favor of external hires. Their lack of career paths creates morale issues and even more turnover as those workers resent the lack of opportunity. Interview #9 is a maintenance manager who discussed how they get low applicants for their open maintenance positions and the ones they do lack the required technical skill sets. Their company is advertising and finding it hard to gain applicants, and they are consistently running short-staffed in maintenance and production roles. Interview #12, an owner, shared a similar comment, "Like I said. Trying to bridge the gap between older and younger generations. Trying to bring all that together" (Personal Interview #12, April 11, 2024). The conversation continued, where he tried to break the cliché mentality that we have always done it this way, so we have to continue doing it this way.

The context of looking at things differently than the status quo bridges the discussion to issues/changes caused by technology. There is a gap between past generations' experience and the technology adaptability of the current generation, which can be considered a change caused by technology because younger generations grew up with a greater abundance of technology than previous generations. Interview #12 talked about adapting new technology to long-standing established manufacturing practices. "Everybody else is moving with technology. And you are staying flat. You will get passed by very quickly" (Personal Interview #12, April 11, 2024). They continued, "You need to grow with the technology" (Personal Interview #12, April 11, 2024). Interview #9, a production manager, noted, "It's just faster (technology). Much technology that

automates simple functions…just the speed is phenomenal, how fast and repeatable the machinery is" (Personal Interview #9, April 6, 2024). Interview #14 described their organization's decision-making sometimes coming too late regarding technology and only making adjustments once a problem has occurred versus being proactive and implementing new technology to minimize the problem. Proactive behaviors and actions were one of the assumptions in defining this research, and this interview confirmed the need for businesses to be proactive.

Interviews #9 and #13 discussed how technological changes had improved the equipment interface and how it is much simpler to set up now than in the past when an operator would have to write lines of code. "Before, you would have to sit down and write lines of code; now, it is conversational. Alternatively, you use a computer that writes out the lines of code for you." The simplicity of the interface was noted by many as a benefit, but as machines have gotten much more complex, the ability to repair them when they go down has also become more complex. Interview 13 then continued that their company is working on new controllers for their machines, and the learning curve of the new machines was more straightforward for younger workers to pick up than older workers because the controllers' interfaces mirrored new technology that younger generations grew up utilizing.

In contrast, when an older machine, a non-automated machine, went down, the material could be scrapped, and the operator typically had the technical skills to adjust the machine, reset the machine again, and start producing again. An issue caused by technology is that when newer automated machines go down, those machines can be much more complex to repair and sometimes require a technician from the machine manufacturer to come in and reprogram, which

can take weeks or months. Nine of those interviewed echoed that sentiment as a risk associated with advanced computerized equipment when it goes down or crashes. Interview #14 stated,

> It is pretty catastrophic when you are relying on, for instance, we had a laser go down once, and it went down for about two weeks. It messed up production badly because they were relying primarily on that one laser. (Personal Interview #9, April 6, 2024)

Interviews #1, #2, and #12 brought up a unique issue with technology. The issue is that companies believe that because technology has advanced, they need to upgrade their machines. All three senior leaders describe how the technology of their product has not changed, and there have been limited upgrades because of the simplicity of what they made. Interview #1 company makes large format plastic products based on a manual process similar to baking bread, putting the plastic into the oven, bringing it out, and rolling it out. The operator must consider the material blend and atmospheric condition and liken it to running a baking oven. Technology in that sector has not advanced past automating the recipe system, but production methods have stayed consistent for decades, and it takes a human operator to understand the production adjustments like a baker tending their dough. The firm also tried robotic trimming of the product, but the edges that needed to be trimmed differed between pieces, and a human was much faster than a robotic trimmer. Again, this shows that there is a balance that senior leaders need to implement when choosing which technology to implement.

The plant manager and interview #7 brought up another issue they believed was caused by technology: communication. The most significant change caused by technology is communication within a plant. They described how an operator working in the plant might have a pager when they started in the plant, and when someone got paged, the other individual would wait around for a call. With cell phones and Microsoft TEAMS, communication with most

people is immediate with instant messaging. They said that is a plus being able to talk to peers globally, but it also causes issues of getting his team to disengage. Unique to this interview, they thought that overcommunication within his global company had the potential to burn people out and affect the retention of employees. This plant manager wanted to communicate deliberately and set expectations that he wanted his middle managers and individuals to trust their people, not micro-manage and disengage from work. Interview #17 touches on communication, stating that they struggled with finding the right work-life balance between working in a hybrid business environment and connecting via cell phone to their work email and messaging applications.

The last issue was private equity. In the original assumptions of the research, it was not anticipated that a discussion on private equity would come up as a theme. Private equity is not a technology, perhaps a modern business trend. However, throughout the interviews, private equity was viewed negatively by those who had been in organizations owned or bought by them or interacted on a potential sale. Private equity firms may have different goals and priorities than the companies they invest in, which can lead to clashes between prior owners and new investors. There have also been concerns about the impact of private equity on employees, as restructuring and layoffs are often part of the buyout process.

The impact of private equity on employees can be profound and multifaceted. Private equity firms often bring in substantial capital, potentially leading to business expansion, job creation, and increased resources for employee development and retention programs. Employees may benefit from enhanced career opportunities, upgraded facilities, and improved operational efficiencies. However, private equity ownership can also usher in significant changes that may be less favorable to the workforce. This type of ownership can include restructuring efforts, cost-cutting measures, and a keen focus on short-term profitability, which may result in job cuts,

increased workloads, and shifts in company culture. The pressure to deliver rapid returns on investment can sometimes lead to decisions prioritizing financial performance over employee well-being. Understanding these potential impacts is essential for business owners and employees to navigate the changes effectively and align to an evolving business environment.

In the first interview, the senior leader was a senior vice president at a large-format plastic company and had a combined 34 years at the company. The owner stated that the company started in the mid-1980s and was led by a transparent leader who openly cared for his employees. This owner discussed the current business situation in monthly company-wide meetings and regularly took feedback from all levels of the organization. At the time, which employed over 500 people, creating a family environment in a business was hard, but it was accomplished. The original owner was on the floor, walking the manufacturing and office weekly and talking to employees. The company was started by an individual leader who loved his product and cared for their people, but that all changed when he sold it to a private equity firm. “The company was sold in 2006, and that is when we saw a big cultural change” (Personal Interview #1, February 20, 2024). Interview #1 stated that since 2006, the company has been in the third set of private equity owners. They stated that the first set of owners caused the business to run into the ground. They stated that "private equity loves money; they do not love our product" (Personal Interview #1, February 20, 2024).

In interviews #3, #5, and #12, owners of family-starting companies shared their experiences with private equity in getting their organizations validated for potential sale. Despite their business validation from the private equity firms, both owners expressed dissatisfaction with the experience. The feedback on their business fundamentally differed from the businesses built, and the cost-cutting measures would be to the detriment of the current employees and

contrary to their family's legacy. None of the owners had a positive view of the private equity firms. Interview #3, for instance, stated,

> Ultimately, if you're about growing people and, you know, and that's my whole thing. If we grow people spiritually, mentally, and emotionally, they'll make a phenomenal product. For me personally, that's what God's asked me to do. And until he says, you're done and it's okay to sell the company, that's the bottom-line answer. It's like, I mean, I need literally almost an audible voice. (Personal Interview #3, March 4, 2024)

Interview #5 in their business currently seeks young engineers out of college excited to learn to make products. They leverage these engineers to run multiple machines using robotics in their business. In the private equity validation, the comment the company gave them this feedback, which he stated,

> And we literally had a kind of private equity person come and evaluate our business. They were like, you have way too many engineers for your sale. Yeah, because our engineers do not sit in a cubicle engineering. Our engineers are on the floor running machines most of the day. So, this is a different model, but it is, it is part of the culture that we have created in having these young kids who are coming in intentionally trying to learn and understand what it is that we do. (Personal Interview #5, March 11, 2024)

Both leaders spoke passionately about being good stewards of the family business and not appreciating their family legacy, which was thought of as merely dollars and cents by private equity. The researcher observed in the interviews that both had genuine compassion and care for their employee's and family’s legacy. The leaders' voices in the interviews showed that they saw their business as a way to grow people and allow them to care for their families. An endeavor greater than just numbers on a balance sheet.

Interview #6 was a director of an operations firm with 35 years of overall manufacturing experience. He had been in situations where his prior companies were sold to private equities and had previously worked for private equity. He had been at his current firm for 1 year and was brought in by the current owner to reduce the organizational damage from the previous private equity firm. The previous owner only focused on month-to-month financial numbers. If the numbers were not on target, they would sacrifice product quality, employees, or whatever was needed to get the month or the following month on track. Interview #6 discussed how, as they came into their role, employees were shell-shocked and unable to make decisions, and they had to start at ground zero, "I spent a lot of time just developing them; they were paralyzed and could not make a decision and felt they had no authority, and they were not empowered" (Personal Interview #6, March 26, 2024). They had to start engaging and developing the employees to adjust the culture to a performance-driven organization. The theme in these senior leaders is that they start with people before technology. They discussed how the current owners are more of an owner-operator type of f private equity and are putting more money into the people and the business, opposite the previous owners.

Highlighting labor issues and desired hiring attributes, issues/changes caused by technology, and the problem of private equity now leads to the solutions outlined by those interviewed. After discussing the various problems and issues, it is essential to focus on the solutions of those interviewed in their manufacturing businesses. These solutions address manufacturing businesses' challenges in the greater Cleveland area of Ohio. At the same time, those interviewed consistently brought up actions and behaviors as solutions to these issues, which remained consistent across all interviews. Sixty-four percent (64%) of the comments coded can be bucketed into these four themes, including employee engagement, communicating

expectations from leadership, employee development, and driving technology. The specific execution to accomplish these solutions differed from business to business and person to person, but the overarching themes remained consistent. Employee engagement and development were noted in each interview, representing 30.6% of the coded comments. The other item of note is that 11 of 18 interviews also referenced the importance of core values or directed management themes as a rallying point to the organization that focuses their employees on a common purpose. Specific core values only amount to 3.6% of the comments, but the theme of core values overlapped with comments from employee engagement and will be discussed as part of employee engagement.

The significance of employee engagement was documented in the interviews conducted and is essential in driving the success of a manufacturing business. Engaged employees are more productive, innovative, and committed to their work, creating a positive ripple effect throughout the organization. By fostering an environment where employees feel valued and motivated, businesses can harness this engagement to fuel employee development—ultimately leading to sustained growth and competitive advantage. Therefore, organizations must invest in their team's development as a strategic priority. This investment nurtures talent and sets the foundation for long-term success in manufacturing.

Employee engagement and core values varied from business to business, but the consistent goal was to make all employees feel a part of a team, communicate expectations, and transparently provide business updates. Of the 418 comments coded, employee engagement was the highest across all interviews, totaling 13.9% of all comments, totaling 58. Themes related to actions and behaviors that leaders and businesses can use to be more successful consistently

trend toward creating a culture focused on employee engagement, communicating expectations clearly, and developing people.

Interview #16 discussed how they believe building relationships is the biggest thing in employee engagement, stating,

> Firmly believing that a team, when it is operating well, should be more than the sum of its parts. You lose a lot of creativity and problem-solving, and the only way to make that work is to build relationships personally with people and then get them to build relationships between them. (Personal Interview #16, May 1, 2024)

Interviews #3 and #5 noted the importance of modeling continuous improvement behavior, including a commitment to learning new things, improving existing processes, and always asking why. It was previously noted that these two senior leaders had observable passion, genuine compassion, and care for their employees. These leaders acknowledge the importance of being good stewards of the family business to grow people and allow them to care for their families. Interviews #2 and #11, owners of roughly 30-person manufacturing organizations, zeroed in on making their employees feel like a family and expressed the importance of caring for one employee and their family. Interview #4 was the operations manager to interview #3 and mirrored the owner's example, stating, "You know. Basically, we are here to serve others. You know, we have a servant leadership philosophy here" (Personal Interview #4, March 4, 2024). That echoes the statement from that business owner: “Ultimately, if you are about growing people and, you know, and that is my whole thing. If we grow people spiritually, mentally, and emotionally, they will make a phenomenal product” (Personal Interview #3, March 4, 2024). Qualitative data cannot be developed from that owner's statement, but he believed that Biblical-

based business principles of caring for people made his business produce a better product and be more profitable.

Interview #15 also highlighted the importance of servitude in leadership, stating that their organization's main go-to for employee engagement is servant leadership.

> Management's primary focus is to lead by example and not point blame when issues arise in the production flow; instead, they work together to find solutions to the problem. They also stated that their main leadership mantra is to seek to understand before seeking to be understood. (Personal Interview #15, May 1, 2024)

Interview #1 spoke of the founder of their large organization of 500 people and mentioned that the founder would make “everybody just felt included and cared for. He made sure he knew everybody he would walk around the plant from the beginning.” The owner would recognize people in the regular monthly company-wide meetings, and all employees would be comfortable standing up and asking questions. People feel cared for when they are recognized for their work.

Interview #8 leads a procurement team for a local plant of a large global company. They touched on their company's core values and an internal system where employees can be recognized on a peer-to-peer basis or by their managers when that individual model's behaviors are represented in that company's six core values. Managers also can submit their employees for spot bonuses depending on the business impact of the employee's action. In the discussion on how the company engages employees and hones the desired behaviors, stating:

> Through positive reinforcement and through recognition. We have various ways to recognize when somebody does a good job. And we, as leaders, we always try to make it

> public for whether in a tier meeting or through an email blast or whatever it might be. (Personal Interview #8, March 28, 2024)

Interview #8 also discussed the company's investment in employee development, particularly in recognizing and nominating employees for additional training to develop into people leaders. Once selected, the employees undergo a tiered progressive leadership progression program tailored to their role and level of responsibility. This commitment to employee development and recognition is a testament to the organization's dedication to fostering a culture of growth and engagement (Personal Interview #8, March 28, 2024).

Communicating expectations from leadership was the second highest-rated coded item, with 10.8% and 45 comments. Fifteen of 18 interviews stated the importance of direct communication with those on their show floor. Interview #12 highlighted the importance of communication, stating:

> Just communication. Communicating with the guys on a daily basis, verbally. Whether it be about the job or even about home life as well. So making sure you actually listen to the employees. And not just assume what's going on. I think that's a big thing across any job that you come across. I think a lot of people get overlooked. With their skill sets and knowledge base. And that really plays poorly on their effort towards the business. (Personal Interview #12, April 11, 2024)

They stressed the importance of face-to-face communication, getting employees on the shop floor to buy into the company's direction, adjusting workloads, and identifying areas for improvement to push production capabilities to their maximum potential. They directly correlated the importance of communication and employee engagement to maximizing production efficiency.

Interestingly, many leaders still find face-to-face meetings to be very important. Senior leader interviews #3, #5, and #16 supported the comments of interview #12 and had regular intervals at which they got their direct reports together weekly and full company regularly. One thing in manufacturing is limited remote work options; operators must be on-site in person. In leadership, the significance of face-to-face meetings cannot be overstated. These in-person interactions foster stronger relationships by allowing leaders to convey expectations and provide detailed feedback on the operation process and quality. Interview # 7 emphasized this point by stating,

> We were talking about communication earlier, but for me, it comes down to you having all the shiny new communication tools in the world, but nothing more effective than sitting down with somebody and having a conversation. That's one really simple example, but the same is true for how do you make sure something is going right in a manufacturing area. It doesn't matter what the technology says; usually, the most effective way is to actually take your butt outside. (Personal Interview #7, March 27, 2024)

In interviews #9, #10, and #13, middle managers working in maintenance and production commented on the importance of face-to-face meetings with their staff. Conducting daily roundups, they can briefly convey the day's essential tasks, shift priorities as needed, and manage workload. This leadership and workload management is handled much more quickly than attempting to lead through email or a messaging app. Face-to-face meetings provide a platform for immediate feedback, encourage open dialogue, and enable a deeper connection between team members and leaders. This direct communication helps resolve conflicts more effectively, make collaborative decisions, and inspire a shared vision within the team. Ultimately, the personal

touch and engagement achieved through face-to-face meetings are essential to successful leadership on a manufacturing floor.

Interview #5, a business owner, emails his company daily at 6 a.m. They deliberately included stats on the current production rate, scrap ratio, and pictures. Pictures of parts they were in the process of making, shipping, or meetings with customers are included. In this business, the owner also leads business development and sales, and when he travels, he includes pictures of customers and their products. Connecting back to servant leadership, he believes it is essential for his production employees to see what is happening outside the factory. They also believe they must know he was working for them, gaining sales and maintaining customers while they were away.

Employee and organizational development is critical to success in the manufacturing sector. From the interviews, 55 coded comments, equaling 13.2% of the codes related to development. Employee and organizational development looked very different from firm to firm, and it was not necessarily based on business size; however, the trend was that generally, the bigger a business, the more established and structured its employee and organization development plans and processes. Six of the 13 businesses had specific tiered progressive structured employee development programs, while others relied upon on-the-job training and direct mentorship from current organizational managers and leaders.

Unlike non-manufacturing industries, rapid product and service innovation does not always drive growth in manufacturing. Manufacturing businesses rely on their workforce's efficiency, skill, and ability to adapt to both established methods while embracing the automated methods emerging with advanced technology. In parallel to the reliance on the workforce's ability, those interviewed also discussed the importance of organizational development and a

step plan for adapting to emerging technology. As previously stated, finding the balance of technology and leveraging it to impact their business significantly is vital. Investing time in employee development ensures that workers remain adept at handling sophisticated machinery, adopting new technologies, and adhering to safety protocols. Employee development also overlaps with employee engagement because a leader must focus on engaging people to develop them, which develops the organization. Employee development enhances productivity and minimizes downtime and errors, leading to a more robust bottom line. Furthermore, the interviews showed that well-trained employees are more likely to feel valued and satisfied, leading to higher retention rates and a more robust organizational culture.

The plant manager and interview #7 discussed communication as an issue they believed could be overdone. However, they also described how they use communication as a tool for employee engagement and development. Developing leaders “has nothing but everything to do with technology. It is sitting down and talking to folks, letting them, you know, asking folks questions, working through development questions instead of directing them” (Personal Interview #7, March 27, 2024). They continued with two examples of how to engage employees in the discernment they use to identify potential future leaders. The first point is, “I'm generally a pretty firm believer that it's a lot easier to take somebody who is moving and redirect than to take somebody who's not moving and get them to move” (Personal Interview #7, March 27, 2024). The second point was stated as,

> Somebody that shows, and it's not necessarily motivation to be in front of people or be loud or be boisterous, but it's a motivation to be better, learn something new, people that are willing to be engaged. I'd rather take somebody who's engaged in doing the wrong

> thing and have them help fix it than take somebody who's not engaged and try to figure out how to get them engaged. (Personal Interview #7, March 27, 2024)

It is interesting and thoughtful to think that an engaged employee is easier to develop as they are already in motion attempting to better themselves. It is easier to match the motivation of a person than to motivate them to be motivated. Much more complicated in the latter scenario. Interview #7 concluded on the characteristics they look for in a future leader, stating, “I value the ability to challenge when we keep pushing versus the status quo. I mean, if a leader wants to not be a leader in my organization, they tell me that they don't want to change” (Personal Interview #7, March 27, 2024).

The idea of matching personal motivation and developing those employees was also supported by interviews #3, #5, and #11, all of whom were business owners. Interview #11 stated, “Those guys seem to rise to the top. I mean, you give them opportunities. Our best guy in the shop was washing cars when we hired him” (Personal Interview #11, April 11, 2024). Interview #3 moved to accept employee applications to be included in a structured development program within a manufacturing company. The application process involves writing a paragraph on why the individual believes they will benefit from more development and learning more about leadership in a 2-year cohort. Evaluate the applicants based on their motivation.

Engaging an employee is crucial in fostering development within a manufacturing organization. When employees are genuinely committed to their growth, they are more likely to take initiative, seek learning opportunities, and contribute meaningfully to their teams. However, this individual commitment must be complemented by the organization's support for development. Companies that invest in training programs provide mentorship and create an environment conducive to continuous learning to enhance employee skills and boost morale and

productivity. Employees and businesses can thrive together by aligning personal aspirations with organizational goals.

Interview #8 was a director of operations and touched on employee development as leaders, stating that they no longer spend much time spreading and reporting and view their role as developing people and getting them to see the organization's vision. One successful item in their case was conducting Kaizen events. These Kaizen events were not limited to management; all employees had multiple sessions. Previously, it was discussed how they had been at the business for about a year, and the employees were shell-shocked and lacked the confidence to suggest ideas based on previous management. Interview #6 shared that engaging the employees, showing care for their development, and listening to their ideas on improving the process started to change the organizational culture by showing care for the individuals.

In interviews, #8, #10, #16, and #17 all worked for large global companies with a presence in Cleveland. All these companies had formal structured development programs. Some of these firms had internal instructors who sat in the human resources department, or a third-party consultant brought in by human resources. From the interview, they all shared a generally positive view of the programs, but the success was based on how the company engaged with the employees.

The last type of development came from on-the-job situations in smaller companies with roughly less than 50 employees. Interview #15, an operations manager in the automotive sector, stated, “Development in their company just happened organically, and you can just see it in the employees that they have the willingness to learn and develop” (Personal Interview #15, April 12, 2024). Interview #15 also stated that they evaluated employees by those willing to listen and used the following statement as a litmus test, “seek to understand before seeking to be

understood.” This business was a complex custom manufacturer, and in their view, employees were willing to understand the business's complexity and truly wanted to grow in their careers and help the organization.

Interview #14 also shared that within their smaller company, those who develop in the company are willing to help others in the organization. This particular business had a wide generational gap. In their view, the older employees worked with newer employees to understand the production fundamentals, and the younger workers helped the older ones understand the updated machine interface. In either instance, employee development was based on an employee's willingness to help others.

In the realm of employee development, these leaders distinguished that there has to be a certain level of motivation and personal accountability in the process. The vital part is that the business leaders need to be able to identify these motivating factors. On the business side, organizations must create an environment conducive to learning. This includes providing access to training programs, resources, and mentorship. Companies should set clear development goals aligned with business objectives and measure progress through performance reviews and feedback loops. Personal accountability, on the other hand, resides with the employees themselves. Workers must take initiative in their professional growth by seeking learning opportunities, setting personal career goals, and actively participating in development activities. While businesses can facilitate development, employees can also seize these opportunities and apply their knowledge to their daily tasks.

The last area of solutions is driving technology. Driving technological change in manufacturing is vital to unlocking unprecedented efficiency gains and fostering innovation. Emerging technologies such as artificial intelligence, the Internet of Things, and advanced

robotics transform traditional factory floors into innovative, interconnected ecosystems. These advancements enable real-time data analysis, predictive maintenance, and automation, significantly reducing downtime and operational costs.

Initially, at the onset of the research, this was assumed to be the significant contributing factor of the study. In hindsight, after what was presented thus far in the feedback from that interview, it is the people that feed the direction of driving technology. Driving technology differed from business to business, some being senior leader-driven while other firms had a continuous improvement team. In many instances, driving technology takes leader engagement. Interview #5 stated, “So we don't have somebody who's the innovation person. I can't help myself but push on the team, say, hey, what about this? What about this?” (Personal Interview #5, March 11, 2024). Interview #16, a plant manager, mirrors those comments, stating, “I guess me, really. Engineering can say, we think you should do this, but ultimately, it's the plant manager that drives that change” (Personal Interview #16, May 1, 2024). In one business where the two owners were interviewed, interview #12 was younger. It took the role of driving technology and looking for new ways to incorporate new technology into the established production process.

Interview #17, a procurement manager, stated, “If we can collaborate more cross-functionally, that is really what moves us to drive change and innovation” (Personal Interview #17). That company is a large chemical company with a chief technology officer who looks for opportunities in the business. It is owned by private equity, which invests in the innovation of new products in the business. Interview #18 stated, “I worked for a very large global company with a technical evaluation team in the corporate engineering and strategy department.” In contrast, interview #3 and the owner have a future technology team, a collection of employees

from various business functions that develop ideas and present them to the senior management team. In contrast, a handful of the businesses had a combination of all employees or everyone responsible for innovation. That sentiment was shared in interviews #6, #7, #10, #15, and #18.

All interviews showed the enhancement of decision-making processes through increased information developed through technological advancements that benefit their businesses. This increased information could be machine performance, where an owner can get text alerts on how the machine is running or YouTube videos that provide real-time information on changes in their manufacturing segment. Technology provides leaders with real-time data and analytics, enabling more informed and timely decisions. This access to data reduces reliance on intuition and experience alone, fostering a data-driven culture within the organization. Additionally, the interviews highlighted the increased need by businesses to focus on continuous learning and development of all staff, leaders, and front-line contributors, staying abreast of technological advancements and trends to remain competitive in their sector.

The last area of the interview guide to be addressed was the section on COVID-19 and how it affected manufacturing businesses in Greater Cleveland. Of the 13 businesses represented in this study, only one was affected by the COVID-19 pandemic. The other 12 were deemed essential, and none of those interviews had much impact because their floor workers were already spread out and working in their own areas. Besides having to buy masks and some extra cleaning supplies, the majority saw their business volumes increase during the pandemic, and it was a profitable time for most of the manufacturers.

The one business affected made parts for the aviation industry that go into fuel pumps for jet aircraft, and passenger volumes were down, causing them to lose 60% of their business volumes. They created a rotating part-time shift so all employees would work part-time, and the

government stimulus money covered the loss of hours. The problem this owner found was that his workers were making slightly more than normal working part-time and getting supplemented by the government. This leader's challenges were employee engagement and motivation; employees had to return full-time once the stimulus money ended. They maintained full employment and did not lay anyone off, but post-COVID, they had to look at motivation and hours differently than in the past. Overall, COVID was a non-issue for manufacturing in Greater Cleveland, and production volumes went up as their customers were stock-piling inventory. Some businesses noted a slight downturn as their customers made inventory adjustments post-COVID. However, those interviewed volumes were back to pre-pandemic levels and could maintain profit margins today.

The methods of collecting information for this study were through face-to-face interviews and observation, with the final method being a survey based on Microsoft Forms that could be emailed, texted, or sent via QR Code on a flyer. In total, 120 responses were received. Each interviewee was given the code and asked to distribute it among their teams' post-interview to support this optional survey. Understanding the importance of qualitative survey results is crucial for comprehensive survey analysis. These insights are invaluable for identifying trends, understanding customer needs, and making informed decisions. By incorporating qualitative survey analysis, research can gain a deeper understanding of the problem, allowing for more nuanced and effective strategies.

Thus, survey results are an essential component of any robust qualitative study. The survey included six lines of demographic data surrounding the person completing it and questions asking if they and their organizations are prepared to handle emerging technology on a sliding 1 through 5 scale. The six lines of demographic data were date, gender, age, highest

education, position (i.e., front-line worker, middle manager, or senior leader), and years in the industry. Table 2 visualizes the participants who completed the survey. The bulk of the respondents were male, 93 out of 120, for 73% of respondents, with an average age of 39.1.

Table 2

Demographic Data

Gender	Number of Participants
Man	93
Prefer not to say	3
Woman	24
Total	120.0
Gender	Average Age
Woman	42.7
Man	39.1
Prefer not to say	35.7
Overall Average	39.7
Highest Education Earned	Quantity
High School	78
Associate's degree	20
Bachelor's Degree	20
Graduate or Higher	2
Total	120
Current Position	Quantity
Front-line Worker	93

Gender	Number of Participants
Middle Manage	24
Senior Business Leader	3
Total	120

Twenty percent of respondents were female, totaling 24 of 120, and three participants preferred not to say their gender, which was three percent, or three of 120 respondents. The respondents' results showed that the highest level of education earned was 65% in high school, 17% in associate's degree, 17% in bachelor's degree, and 2% in graduate or higher.

Seventy-eight percent (78%) of respondents to the survey were front-line workers, 20% were middle-managers, and three percent were senior leaders of the organization. The Survey intended to gather a bottom-up view of how front-line workers view the impact of emerging technology on manufacturing leadership. The survey asked the participants to answer seven questions on technology preparedness: three directed toward their current organization, two toward the organization’s leader, and one toward themselves. The eighth question asked about the complexity of technology for manufacturing leaders. Figure 3 below contain the results of the survey questions. Overall, the results are favorable to both organizations, with the average of the first seven questions being very prepared at 32% and somewhat prepared at 46%, combining to a 78% favorable rate. Question eight asks if the respondent thought that automation reduced or increased the decision-making complexity of manufacturing leaders.

Figure 3

Survey Results Questions 1-7

	How would you rate how prepared your organization is to handle new technology?	To what extent do you think technology has enhanced the effectiveness of the organization's manufacturing process?	Do you feel you have the skills and training to be adaptable to future training?	How do you feel your business leaders are prepared to implement technology in your business sector?	How would you rate new technology to increase productivity in your Industry?	How would you rate technology's ability to make leaders more effective?	How does your organization use digital tools to support and enhance its leadership development programs?
	Organization	Organization	Yourself	Organization's Leaders	Industry Sector	Organization's Leaders	Organization
Preparedness Level	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**
Very prepared	23% (23)	28% (33)	57% (67)	31% (37)	31% (36)	32% (38)	23 (19%)
Somewhat Prepared	52% (62)	53% (62)	34% (40)	47% (57)	49% (58)	43% (51)	52 (44%)
Neither Prepared nor unprepared	13% (15)	11% (13)	4% (5)	9% (11)	15% (18)	17% (20)	20% (24)
Somewhat unprepared	8% (8)	6% (7)	2% (2)	4% (5)	3% (4)	4% (5)	10% (12)
Very prepared	6% (8)	3% (3)	3% (4)	8% (9)	2% (2)	3% (4)	6% (7)

Table 1 - Question Eight Response

#8	Has automation reduced or increased decision-making complexity for manufacturing leaders regarding their ability to react quickly and accurately to changing conditions within the Industry?
Reduced	32% (38)
Increased	68% (80)

The answer in Figure 3 shows that the majority believed that automation had increased the complexity of the decision-making process for the manufacturing business. The results of the surveys show a positive view of the respondent's organizational leaders and their ability to adapt to technological change. One note on the data is that most responses came from two of the 13 businesses participating in this study. The leaders interviewed for this study were engaging in the interview process, but the expectation that they would distribute the Survey and participate in the research interview was naive. The assumption is that middle managers and senior leaders prioritize their work over the distribution of the survey link. Overall, it is disappointing not to have a greater sample size with different perspectives. However, the assumption is that based on the dates of the survey, it is believed that 75% of responses came from businesses three and four. Based on the researcher's observation, those two businesses had the most engaged leaders and employees working as a team. Those business leaders, in parallel, verbally spoke of modeling the

behavior they wanted their organizations to mirror; both were pushing technology in their processes and had internal continuous improvement teams looking at new processes and technology in their manufacturing businesses. The correlation from the research is that the engaged leader was also able to get greater survey participation based on how their employees viewed them and, in turn, provided greater survey results.

Interpretation of Themes

Interpretation of themes is not complex, and good or bad leadership is believed to transcend technology. Technology only accomplishes task-based work prescribed by humans or learned through algorithms defined by man. At some point, a human has to initiate the direction of the technology. There are instances outside this study where technology can predict and prescribe a specific task. Manufacturing technology can improve production efficiency, decrease set-up time, or predict what product needs to be produced. Nevertheless, this research shows that human capital is the most important aspect of manufacturing in the greater Cleveland area of Ohio.

Human capital can produce exceptionally more products with increased productivity and advanced machinery, but the key is still the person behind the machine. Overwhelmingly, interpersonal relationships and the humanity of caring for people were believed to be the priority, followed by improving technology. Individual business owners or larger global firms with a presence in Cleveland, Ohio, consistently stated that human capital and people were their primary focus. Another point of data is that the businesses that participated in this study were all believed to be faith-based leaders to a certain degree. In total, 18 individuals were interviewed, representing 13 businesses in the Greater Cleveland area. However, 13 individuals originally agreed to be interviewed and then stopped responding to emails and calls to schedule the

interviews. In two cases, the potential interview subjects changed their decision when they realized the research was for Liberty University and they did not want to be part of a religious interview. Interview request rejection and communication ghosting can also be aspects of research interpretation. In the context of this research and those interviewed, it is believed that their faith played a part in their participation and being generous with their time. In addition, a faith-based perspective can also be correlated to a more people-centric leadership approach in their businesses.

Previously, it was discussed that interviews #2, #3, #5, #11, and #12 owned manufacturing and fabrication businesses that took over their business from their families. All owners gave the researcher a tour of their business, their interaction with their products and processes, and, more importantly, their people on their manufacturing floors. Through observations, it was somewhat perplexing to see high-fives, handshakes, and hugs from employees on the floor, and in those instances, it was observed that these owners cared for their employees. They genuinely care for their people. Another critical aspect of these owners, as it was noted, were also people of faith. That faith is believed to have a different worldview than other business leaders and a calling to care for their employees differently. All interviewed consistently prioritized people as their most important asset, but there was a noticeable difference in the businesses that directly brought up their faith in their interviews. Within their offices or manufacturing areas, they had faith-based flyers or posters within the building.

These tours were not part of the recorded interviews, but the owner's passion for their product, technology, and people was very noticeable. Interview #2 stated, “I hire a person I do not even know. I hope within 6 months they are a friend” (Personal Interview #2, February 22, 2024). These businesses range from 30 to 110 employees, and in each instance, the person knew

everyone's name, spouse's name, and kids' name. They introduced me to each person working and knew specific things about every employee and what was going on in their life outside of work. Interview #12 stated, "I know everybody's employees' wives' and kids' names. And, you know, so we try to keep it tight" (Personal Interview #12, March 11, 2024). In this context, this 28-person business idea is that a tight-knit group of employees will enjoy work more and produce more. Even more important than producing more is that they will develop more as people. Interview #5 stated their approach to leadership was intent-based, stating, "Partly, I am modeling the behavior that I expect the team, which is, um, I am very consistently trying to learn and expand my horizons and wanting them to do the same thing" (Personal Interview #5, March 13, 2024).

The research did not identify a significant presence of a leadership skill gap related to technology; however, the research did prove the theories that supported the conceptual framework defined in the research proposal. The fast-paced and ever-changing business landscape requires leaders to understand transformational leadership, adaptive leadership theory, and situational leadership approaches to evolve better, lead their organizations, and find the needed balance between people and technology.

This includes modeling the behavior of utilizing technology to enhance their leadership skills and empowering their teams to participate. However, it is equally essential for leaders to understand that human capital remains at the core of effective leadership. Technology can undoubtedly aid in streamlining processes, increasing efficiency, and improving communication within a team. Nevertheless, ultimately, it is the people who drive an organization forward. Effective leadership requires building strong relationships, fostering open communication, and creating a supportive work culture - all driven by human interaction.

In summary of the interpretation of themes, the interviews underscored that while technology is an essential tool in modern leadership, human capital takes precedence. The insights gathered from the semi-structured interviews reveal that there may not be a significant gap in leadership skills; the challenge lies in striking the right balance between leveraging staff capabilities and labor issues and integrating technological advancements. Effective leadership ultimately hinges on harmonizing these elements, ensuring that human and technological resources are utilized to their fullest potential.

Representation and Visualization of the Data

The hierarchy chart generated by NVivo visually represents the patterns in the final coding phase. The box size correlates to the number of comments and the percentage of total comments. Figure 4 shows final codes with theme consolidation, including the number of comments and the percentage of total comments.

Figure 4

NVivo Hierarchy Chart of Final Codes

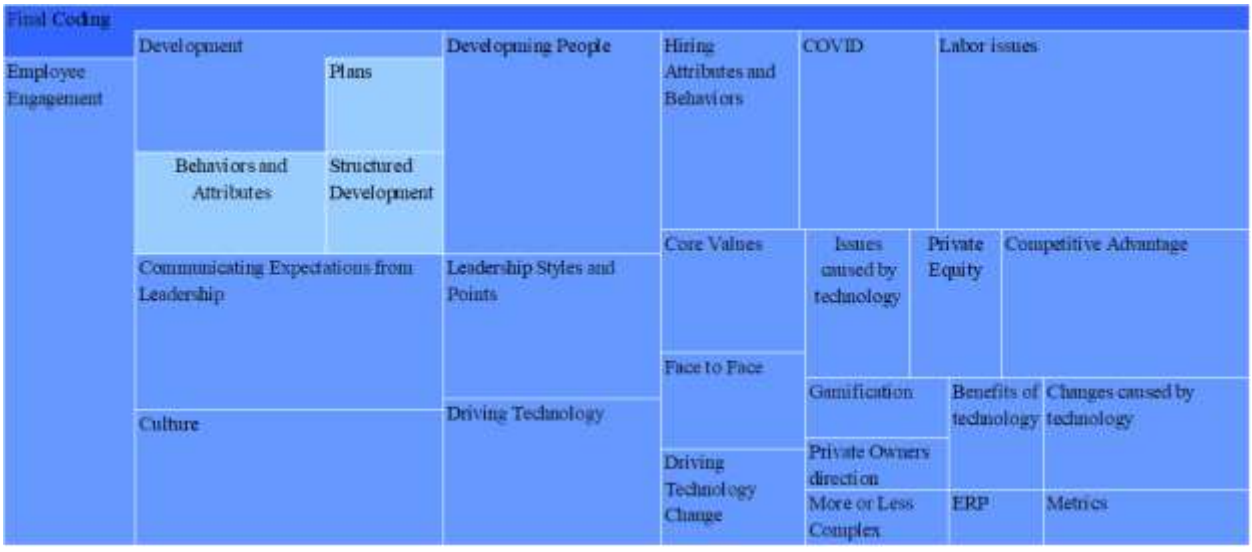


Table 3

Final Codes with Theme Consolidation

#	Description	#	Percentage
1	Employee Engagement / Core Values	73	17.5%
2	Development / Developing People	55	13.2%
3	Communicating Expectations from Leadership	45	10.8%
4	Culture	38	9.1%
5	Leadership Styles and Points	29	6.9%
6	Driving Technology	28	6.7%
7	Hiring Attributes and Behaviors	23	5.5%
8	COVID	21	5.0%
9	Labor Issues	18	4.3%
10	Driving Technology Change	13	3.1%
11	Face to Face	13	3.1%
12	Issues Caused by Technology	12	2.9%
13	Competitive Advantage	8	1.9%
14	Private Equity	8	1.9%
15	Gamification	7	1.7%
16	Benefits of Technology	6	1.4%
17	More or Less Complex	6	1.4%
18	Private Owners Direction	6	1.4%
19	Changes Caused by Technology	4	1.0%
20	ERP	3	0.7%
21	Metrics	2	0.5%

Relationship of the Findings

The Research Questions. The research questions provided the direction to answer the specific problem statement of the gap in business leaders' potential technology skills between managing manufacturing companies in Ohio's greater Cleveland metropolitan area, resulting in lost revenue and business opportunities. The research questions and sub-questions also addressed the research methodology and fit into the positivism paradigm accomplished through a multi-case study approach necessary for real-world qualitative data to analyze and assess business organizations. The research questions found the balance of the actions and behaviors an organization or individual can do to reduce the effects of emerging technology.

A leader's unpreparedness was presumed due to a skills step gap and assumed to be reflected in an organizational decrease in productivity, efficiency, employee satisfaction, and organizational stability. The qualitative research questions supported and strengthened data collection and observation. RQ1, RQ1a, RQ1b, RQ1c, and RQ1d proposed identifying ways for a business to prepare leaders by diagnosing their actions and behaviors for the future.

Organizational responsibility is the actions and behaviors that the organization's leaders can utilize to lead and manage effectively in an advanced technology age. On the other hand, individual responsibility refers to an employee's actions and behaviors to adapt and thrive in an organization with advanced technology. Organizational responsibility plays a crucial role in managing business operations successfully in an age of advancing technology. It encompasses the actions and behaviors of organizational leaders that influence how technology is adopted, implemented, and utilized for achieving business goals. The interview data showed that the leaders firmly understood emerging technologies and their potential impact on their business. Yet, the interviews consistently focused on engaging and developing the organization's people

first. The strategic decisions revolve around the number of technology investments, specific implementation processes, and employee training programs. Moreover, organizational responsibility also includes creating a culture that embraces change and innovation, which requires effective communication strategies, team collaboration, and a continuous learning mindset.

Research question one and subquestions specifically looked to gain insights into the actions and behaviors of the business leader to be better prepared to address emerging technology. In research question development, it was intentional to specifically ask the difference between actions and behaviors related to the specific business and the leader individually. The primary role discovered through the research is that the business needs to create an environment and organizational structure that allows individuals to be engaged and developed. It needs to be deliberate in a structure that gives people the psychological security to be open to communicating freely. Interviews #3 and #7 spoke of creating relationships with their people, employees, families, suppliers, or customers to communicate and learn about their priorities.

Subquestion RQ1a examines what behaviors a business can do to prepare leaders better to manage advanced technology. As the research shows, advanced technology starts with an individual. The business can create specific teams and allow selected team members to review processes, procedures, and technology associated with their business. Another action the business can take is to create leadership tiers or career paths that fully provide current leaders and supervisors with an understanding of their area of responsibility. This area of responsibility should include decision-making ability, which empowers the employee, improves engagement, and develops the worker's skills to be better prepared to work with more advanced technology.

Subquestion RQ1b looks at the behaviors that show current individual contributors that there is a path for future advancement within that structure. Through observation during the on-site interviews, it was observable that behaviors that create psychological security encourage more engaged behaviors. Psychological security is essential for manufacturing employees, impacting their overall well-being and productivity. Matsunaga (2021) noted that employees will feel incentivized to engage in new work behaviors related to new technology when they feel psychologically secure in their workplace environment. The research interviews show that a supportive work environment fosters loyalty, reduces turnover rates, and enhances team cohesion. Prioritizing psychological security not only benefits employees but also drives the company's success by creating a safe, positive, and productive workplace.

Subquestions RQ1c and RQ1d relate to a leader's specific actions and behaviors that a leader can do to help manage advanced technology. Consistently, the data from the interviews of middle managers and senior leaders shows that the actions the leader can take are to communicate expectations and continue the reason for the business direction. In the process, use all tools available to convey those expectations, including face-to-face communication, emails, texts, YouTube videos, books, or pictures. Redundant communication is actionable, and leaders should be deliberate in trying to be as transparent as their employees. Lastly, the behavior needs to be modeled on continuous improvement of oneself, the organization, and those around them. They were being deliberate in their actions.

RQ2 and RQ2a attempt to discover why there is a skills gap in managing digital transformation. The themes discovered noted that perhaps there is not as large a skills gap as was initially assumed for this research. The more significant issue was finding the right balance of technological solutions that offset labor issues and optimize current manufacturing procedures

and processes. RQ2a looked to see what training is available to develop its leaders. Six of the 13 businesses interviewed had some form of leadership development training in a structured manner. Four of the six businesses used third-party consulting to conduct the training, one the owner-facilitated curriculum they purchased, and one of the larger global companies had an internal training team. The businesses that seemed the most effective through observation and interview analysis were the ones that offered leadership development training to different tiers of the organization. Two of the six, plus one other business, also offered tuition reimbursement for employees for college classes as long as the courses remotely supported the organization.

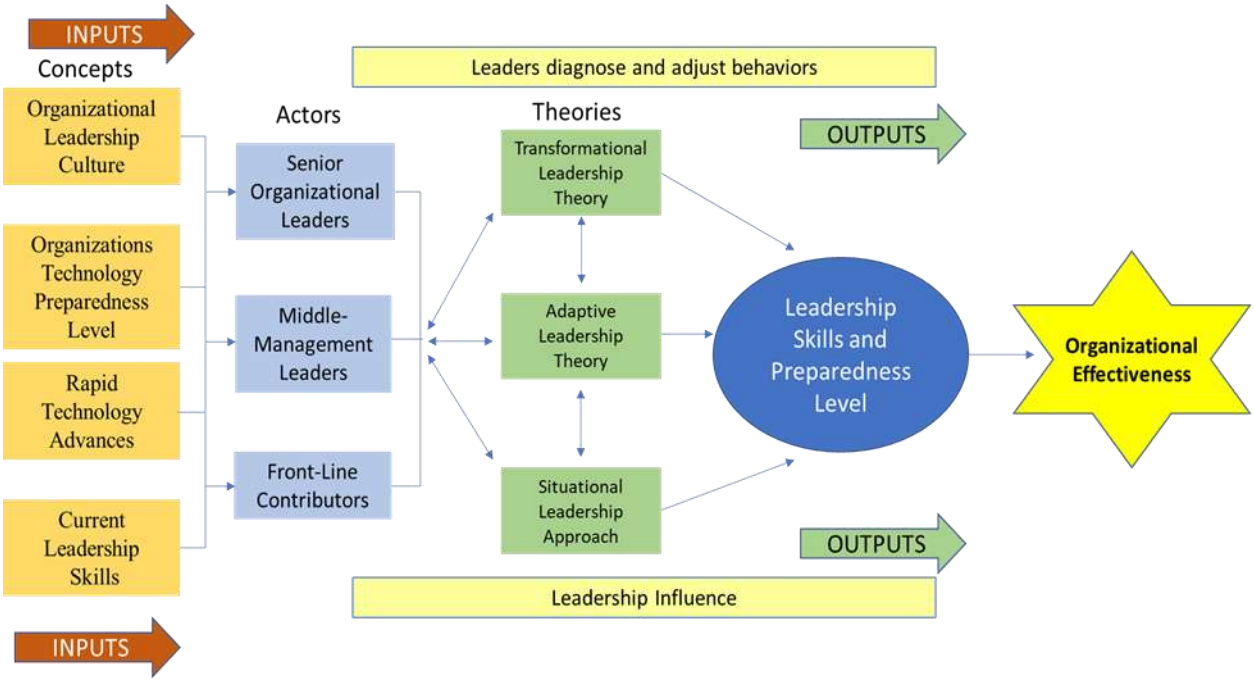
RQ3, RQ3a, and RQ3b highlighted how organizational success can be accomplished by reducing the leader skills gap in managing rapid digital transformation, improving both business revenue generation and business opportunities. As stated, there did not seem to be a skill gap as large in technology. However, the more pressing issue was developing and retaining staff to constantly improve existing processes while implementing new technology to increase opportunity and revenue. The interviews did not request specific financial input, and RQ3 was answered through the provided comments. The senior business leaders were more forthcoming in discussing that automation increases production volume. For example, interview #11 stated that as they replace manual machines with automated machines, generally, the machines produce three times the number of parts with the same number of man-hours. This increases the profit margin on the part as the labor that used to be associated with one part is now going into making three parts. Interview #6 discussed how they have implemented a new processing tool, which allows them to bid on new work due to the increased equipment capabilities. This created a new opportunity for business. The developed interview guide supported the development, and this study's research questions looked at how a business's or leaders' behavior can influence

leadership in managing emerging technology in their business section. The actions and behaviors presented in the themes discovered in this paper support the answers to the research question.

The Conceptual Framework. The conceptual framework of this study supported the qualitative research with a flexible design that utilized a multiple case studies approach with a positivism paradigm. Through individual face-to-face interviews with senior leaders and middle managers of manufacturing businesses, this research looked at the impact of advanced technologies on business leadership, including the people, processes, and platforms. Artificial intelligence, machine learning, and big data provide mountains of data businesses must manage.

Figure 5

Relationship between Concepts



The conceptual framework for this study is based on the concept that to reduce the leadership skills set gap, a leader needs to understand transformational leadership, adaptive leadership theory, and situational leadership approach. These three principles create the need for the organization to change due to changes in the business environment. From this study,

transformational leadership led to the skills of adaptable leadership theory, followed by the situational leadership approach, which supports the assumption that a leader would need these skills to succeed. Senior business leaders need a proactive approach to ensure the viability of their organizations. Business leaders need to understand the impact of technology on their business sector so their businesses can adapt to the constant technological changes, maintain market share, and drive future opportunities.

The themes identified in the research illustrate the impact of technology on leadership within manufacturing firms, highlighting both opportunities and challenges that leaders must navigate in the digital age. As the technology input continues to evolve and advance, it affects the actors of this study. As senior organizational leaders and middle managers, it is essential to adapt to the situation and find the balance of technology and how to leverage it to make the most significant impact on their business. Across all interviews, coded comments related to problems or issues can be considered the inputs the actors need to evolve their actions and behaviors, ultimately leading to organizational effectiveness. These inputs include labor issues and desired hiring attributes, issues/changes caused by technology, and private equity. Themes related to actions and behaviors can be considered the leadership skills and preparedness level in dealing with technology that leaders and businesses can use to be more successful. These leadership skills included creating a culture focused on employee engagement, communicating expectations clearly, and developing people. Emerging technology coupled with labor constraints will change the business landscape. The research interviews were consistent with the conceptual framework, which states that senior business leaders and middle managers need a proactive approach to understand and ensure the viability and impact of new technology on their business.

Relationships to Anticipated Themes

The initial theme surrounding this study is that senior business leaders and middle managers cannot know everything about emerging technologies, which is impossible even for business technologists. However, they should know some technologies most likely to impact their businesses (Andriole, 2021). Leaders should seek optimization and best practices to consider technological concepts that meet and exceed business objectives. Through the research interviews conducted, four themes emerged, including employee engagement, communicating expectations from leadership, employee development, and driving technology.

Andriole (2021) said that business leaders should be able to explain their existing business models fluently and better than pundits and industrial consultants. This proved to be true in the interviews with the senior leaders and middle managers. Regarding driving technology, the senior leaders interviewed were consistent with Andriole's (2021) study in that they are responsible for optimizing technology and strategically thinking about their businesses to ensure they remain relevant and enjoy competitive benefits. Those leaders must also be able to design and create a culture that promotes creative thinking. Interview #5 discussed this as intent-based leadership, where they model the behavior they want to see in their employees.

Jain and Ajmera (2021), Tūtlys and Spöttl (2022), and Zeba et al. (2021) conducted research and published scholarly articles on the manufacturing industry and the impact of Industry 4.0. The themes for those studies looked at different aspects of Industry 4.0. Jain and Ajmera (2021) noted that the manufacturing sector has seen crucial expansions in almost all dimensions by attaining technological advancements and the implementation of Industry 4.0, which creates smart factories that transform current production and manufacturing. Zeba et al. (2021) offered scholarly literature on AI in the manufacturing sector before and after the

emergence of Industry 4.0. Content analysis was adopted, and results showed that smart manufacturing, big data, deep learning, and real-time scheduling are more popular topics today (Zeba et al., 2021). Tūtlys and Spöttl (2022) conducted a study to expose the effects of the 4th Industrial Revolution on professional and vocational qualifications and their systems. The research also sought to enhance an active discussion between researchers and experts on the changes in professional and vocational qualifications shaped by the arrival of the 4th Industrial Revolution (Tūtlys & Spöttl, 2022). This study did not have any interviews that mentioned Industry 4.0 by name. However, the respondents were all evaluating the aspects of more intelligent and automated machines in their improved business processes. The themes consistent with this research were that technology increases production capabilities and allows businesses to bid on new business that they would not typically date equipment.

This thought was also noted in interviews #6 and #11. In interview #6, they referenced that as they implemented new equipment in their factory, they could go after work that they previously could not be due to a lack of capability. Interview #11 noted that as they updated machines and interfaces, they could produce three times more parts than they could with a more manual process. Kinkel et al. (2022) noted similar thoughts in that the impacts are radical and have led to the emergence of Industry 4.0, which offers flexibility and efficient products, enabling organizations to have improved mass production.

Martín-Peña et al. (2019) noted combining servitization and digitalization as two crucial trends in the manufacturing industry that can significantly impact organizational performance. In this research, two interviews were conducted with large global companies that are developing servitization and digitalization as part of their product offerings. Neither location in the greater Cleveland area participated in that aspect of the business. Interview #18 mentioned a

servitization and digitalization project to identify the customer's needs and help improve product development. That is consistent with the comment from Martín-Peña et al. (2019), who noted that combining both concepts creates more incredible manufacturer benefits that can enhance processes by offering digitally enabled services and creating more value for customers.

Dachs et al. (2019) conducted a study investigating the relationship between the backshoring of production activities and Industry 4.0. Backshoring is a decision to relocate manufacturing activities back to the home country of the parent company (Dachs et al., 2019). Industry 4.0 supports backshoring by providing higher flexibility and productivity and enticing incentives that allow organizations to locate production close to their European customers (Dachs et al., 2019). In the case of the study, five of the businesses that were interviewed were third-party manufacturers. Three of them mentioned that they had gained work from customers who brought back some domestic manufacturing that used to be abroad. Statistics show a relationship between implementing Industry 4.0 technologies and the propensity of organizations to backshoring (Dachs et al., 2019). By adopting Industry 4.0, organizations improve efficiency and competitiveness.

It has been noted that the speed of change in the manufacturing business environment due to artificial intelligence and advanced technology was more to their specific manufacturing segments. Those interviewed as part of this study contained both skill sets, but what became apparent across all interviews was striking the right balance of skillsets to manage change between leadership and technical skills. Manufacturing leaders should seek optimization and best practices to consider technological concepts that meet and exceed business objectives. The five actions or behaviors that became themes that emerged in the research interviews were consistent with the anticipated studies as they represent a changing manufacturing landscape. The four

themes of employee engagement, communicating expectations from leadership, employee development, and driving technology are consistent with the anticipated studies.

Literature in Comparison to Findings. Studies in the current literature are related to the effects of advanced technology on the manufacturing business sector due to emerging technology being developed at an accelerated rate, which could cause a leadership skills gap. Lundgren et al. (2021), Rossini et al. (2021), Shen et al. (2021), Szász et al. (2021), and Tortorella et al. (2017) wrote on aspects of Industry 4.0 and digitalization on manufacturing performance. Henderikx and Stoffers (2022), Jackson and Dunn-Jensen (2021), Nair (2019), and van Laar et al. (2017) wrote about the digital transformation's influence on future leadership behaviors and management approaches to handling digital transformation.

Relevant literature or related studies addressed the effects of advanced technology on the manufacturing sector as emerging technologies are being developed at an accelerated rate, assumingly causing a gap in leadership skills. Emerging technology creates a skills set gap where business leaders need to find solutions to managing their current and future workforces, which potentially causes a loss of revenue and business opportunities (Card & Nelson, 2019). Organizations that can move in parallel with technology trends will be faster, more flexible, more competitive, and retain market opportunities (Zeike et al., 2019). Henderikx and Stoffers (2022) noted in their studies the changes in leadership and management compared to the rate of technological advances. They noted the evolution of leadership traits and skills to adapt to this change in the business environment. The skills gap is due to technological advances, which cause organizations of all sizes to struggle with accelerated technology management due to organizational decisions' scale, depth, and urgency (McCarthy et al., 2021).

This research assumes that most business leaders today do not have the leadership skills to manage and lead their teams through emerging technology. As noted previously in this paper, perhaps, post-interviews, that assumption was too bold. Leaders interviewed had a blend of technical and leadership skills and were currently effectively guiding their firms. The speed of change in their business environment due to artificial intelligence and advanced technology was more to their specific segment. Some of those businesses had outdated processes, but because of the uniqueness of their products, there was still a demand regardless of the antiquated equipment, and they said they were profitable. However, they acknowledged that they could be more efficient by increasing the usage of automated equipment. The interview data showed that those leaders contained both skill sets, but what became apparent across all interviews was that they had struck the right balance of skill sets to manage change between leadership and technical skills.

Zeike et al. (2019) examined whether digital leadership is related to the psychological well-being of upper-level managers. A survey was conducted on 368 managers from a German ICT company. Results indicated that managerial experience, gender, and age did not affect the outcomes. However, more research is required to determine the causal impacts of the relationship between well-being and digital leadership (Zeike et al., 2019). This implies that the working conditions of managers can impact their well-being. It is crucial to note that the psychological well-being of managers is a multi-dimensional concept that involves satisfaction with life and self-esteem. It would be difficult to prove from the semi-structured interviews if the senior leaders or middle managers had better psychological well-being due to their working conditions. Through observations on plant tours and interviews, #3 and #5 seemed to be the most joyful leaders, showing how they built on their family business and grew it in size and scope.

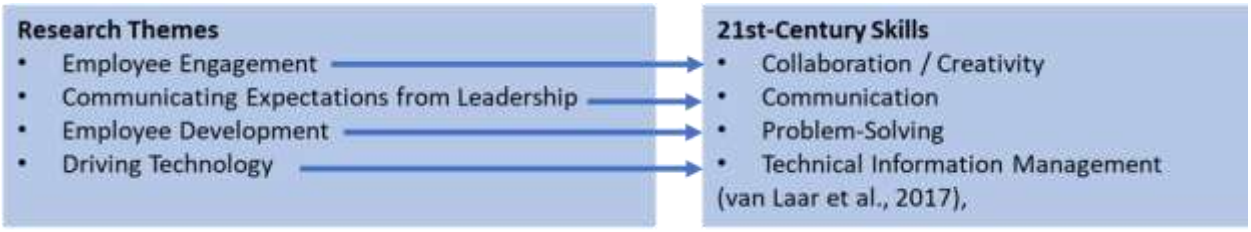
Organizations constantly seek ways to improve their sustainability and competitiveness in a rapidly changing business environment. The relationship between innovation, servitization, and digitalization can significantly affect organizations' success. For instance, servitization creates new opportunities for digitalization, such as using sensor data to give maintenance services (Shen et al., 2021). On the other hand, digitalization facilitates innovation and performance by providing the necessary tools and resources to develop and test products. Finally, innovation is the ability of organizations to create new products, processes, and services that add value to the organization and companies (Shen et al., 2021). Two interviews of this research worked for large global companies developing servitization and digitalization as part of their product offerings. Neither location in the greater Cleveland area participated in that aspect of the business. Interview #18 mentioned a servitization and digitalization project to identify the customer's needs and help improve product development. Based on their product offering, it can be assumed that those businesses would increase in digitalization and servitization, innovation, and performance.

In a rapidly changing business environment, possessing 21st-century digital skills helps innovation capacity and organizational competitiveness. Although such skills are essential, the digital aspect of integrating them is not fully defined. van Laar et al. (2017) conducted a systematic literature review examining the relationship between digital and 21st-century skills. The study also intended to formulate 21st-century digital skills with operational components and theoretical dimensions to sharpen workers' knowledge. One thousand five hundred ninety-two (1592) articles were screened, and results showed that 21st-century digital skills are more important than digital skills of the past (van Laar et al., 2017).

On the contrary, unlike digital skills, 21st-century skills are not underpinned by ICT. The researchers also identified various essential skills in linking digital and 21st-century skills, which focus on a firm's human capital. These skills include collaboration, creativity, technical information management, problem-solving, and communication (van Laar et al., 2017). The four themes of this study, including employee engagement, communicating expectations from leadership, employee development, and driving technology, appear to be consistent with van Laar et al. (2017), as shown in Figure 6.

Figure 6

Themes Comparison



A connection from van Laar et al. (2017) identified a correlation between the research themes of human capital-based themes from this study and 21st-century skills. In the 21st-century, skills, collaboration, and creativity engage employees and make them part of the business process; communication is directly linked, and employee development includes developing problem-solving skills. Lastly, driving technology has a direct overlap with technical information management.

Szász et al. (2021) conducted empirical research using a systematic literature review. The study was based on a survey of 705 manufacturing firms from 22 countries. A structural equation modelling was adopted to determine the relationship between various areas of interest and provide a detailed analysis of the main effects. Results indicated that Industry 4.0 positively impacts operational performance, including flexibility, cost, delivery, and quality performance

(Szász et al., 2021). The findings also showed that multinational corporations do not have advantages over local firms and that larger firms invest more heavily in Industry 4.0 technologies. Companies with these technologies are more competitive and are more aware of opportunities that keep them sustainable. From the interviews of this research, the only advantage of multinational corporations was the amount of capital they had. Data from the interviews revealed that companies became more competitive when adopting advanced technology as it increased their production and allowed them to go over new work where previously they did not have the capability.

Rossini et al. (2021) studied how manufacturing firms adopt digital transformation and its effects. Different case studies were included to yield convincing results. Organizations were identified based on their lean maturity, and digital transformation patterns were analyzed and assessed from literature and cases. Results indicated how lean influences digital transformation. Two patterns were identified: disruptive and sustaining digital transformations (Rossini et al., 2021). Both patterns promote a lean culture, which plays a significant role in digital transformation. From the findings, lean promotes digital transformation patterns in organizations. Supporting Rossini et al. (2021) is that due to the labor shortage in the manufacturing businesses, they are having to become lean out of necessity. The issue of finding and retaining workers was consistent. All 18 interviews representing all 13 businesses stated that labor availability is one of their main concerns going forward, creating the most significant need for advanced technology. In interviews #3, #5, # 11, and #12, all business owners brought up that the inability to find willing workers is one of the main reasons they are pursuing advanced technology and more automated machines in their manufacturing process.

These articles do not necessarily look at how the actions or behaviors of the leader can affect the business performance in either a positive or negative fashion. Howard (2019) and Molino et al. (2021) did not note the behavioral approaches related to the skills gap or separate the difference between the leader and the workforce. One aspect of all related studies did not look specifically at the effects of advanced technology on manufacturing businesses of the Greater Cleveland area of Ohio. This study reduced gaps in the current literature by focusing specifically on manufacturing companies in the Greater Cleveland Area of Ohio. It identified problems and issues facing current companies. It outlined the actions and behaviors that those businesses and their leaders can take to influence the impact of technology in their organizations positively.

This research assumed that most business leaders today do not have the leadership skills to manage and lead their teams through emerging technology. As noted previously in this paper, perhaps, post-interviews, that assumption was too bold. Leaders interviewed had a blend of technical and leadership skills and were currently effectively guiding their firms by focusing on people and their human capital. Of the 13 manufacturing companies, their products ranged from food and beverage, aviation components, contract metal machining, large format plastic products, specialty chemicals, automotive production, and electrical components. The speed of change in those segments was not as pronounced compared to other manufacturing segments. The dated manufacturing processes of some of these businesses could be sustained due to the uniqueness of their products in the market. The lack of advancement to more advanced machines kept them idled in their current market position and limited future growth. They were able to verbally state that they were profitable but limited through growth due to dated and manual processes. They acknowledged that they could be more efficient by increasing the usage of

automated equipment. The interview data and site observation showed that these leaders had technical and leadership skill sets. As a problem related to these 13 businesses, the skills gap is striking the right balance of skill sets to manage technical change with the availability of labor. Human capital-related themes included employee engagement, communicating expectations from leadership, employee development, and driving technology.

In their research, Henderikx and Stoffers (2022) noted that future-proof leaders must be people-oriented, technically minded, valuing, and leading with creativity and collaboration with a mindset fit to lead a new generation of workers in the digital age. Consistent with these research findings, they also noted that the speed of digital transformations combined with globalization requires all manufacturing employees to update their competencies regularly across their lives (Henderikx & Stoffers, 2022). Henderikx and Stoffers' (2022) human-capital-based skills are also consistent with the views of van Laar et al. (2017), which included collaboration, creativity, technical information management, problem-solving, and communication.

The Problem. The background of the problem is the effects advanced technology has on the business sector, with emerging technology being developed at an accelerated rate, causing a gap in leadership skills compared to the speed of technological advancement. The general problem addressed is the challenges business leaders face in managing advanced technology due to a skills gap, resulting in lost revenue and business opportunities. According to Card and Nelson (2019), emerging technology creates a skill set gap, where business executives need to find solutions to manage their current and future workforces, which causes a loss of revenue and business opportunities. Jackson and Dunn-Jensen (2021) explained that business leaders do not understand the effects of digital transformation on business. The specific problem addressed is the gap in business leaders' potential technology skills between managing manufacturing

companies in Ohio's greater Cleveland metropolitan area, resulting in lost revenue and business opportunities.

The research problem of a leadership skills gap is believed to be answered related to manufacturing businesses in the Greater Cleveland area of Ohio by identifying the common issues and problems faced by these manufacturing businesses and highlighting the actions or behaviors that organizations and their leaders can use to manage their businesses to the future. Organizational and individual responsibility plays a crucial role in managing business operations successfully in an age of advancing technology. Encompassing actions and behaviors of organizational leaders that influence how technology is adopted, implemented, and utilized for achieving business goals. Leaders showed that the perceived skills gap of the original problem was overstated and that the leaders interviewed had a thorough understanding of the emerging technologies and their potential impact on their business sector. Nevertheless, the research participants consistently focused on engaging and developing the organization's people first. The strategic decisions revolve around the amount of technology investments, specific implementation processes, and employee training programs. Moreover, organizational responsibility also includes creating a culture that embraces change and innovation, which requires effective communication strategies, team collaboration, and a continuous learning mindset.

Summary of Findings

The findings of this research on technology's effects on manufacturing leadership reveal insights into how technological advancements are reshaping the manufacturing industry in Greater Cleveland, Ohio. The study found that leaders who integrate employee engagement, clearly communicate expectations, develop employees, and drive technology into their

operations enhance production efficiency and foster a more agile and innovative workforce. This shift drives manufacturing to new heights as leaders leverage human capital to utilize advanced data analytics and automation to develop more efficient and streamlined manufacturing processes. Integrating technology in manufacturing leadership is a game-changer, enabling companies to remain competitive and responsive in a rapidly evolving market. The integration of technology also promotes a more agile workforce.

The study differed from existing studies on leadership and emerging technology as no research specifically focused on manufacturing companies in Ohio's greater Cleveland metropolitan area. Similar studies from the literature findings were Lundgren et al. (2021), Molino et al. (2021), Rossini et al. (2021), and Tortorella et al. (2017), which used some form of interviews or focus groups on their studies to assess the impact of technology on manufacturing businesses.

Lundgren et al. (2021) conducted eight demonstrations on set data and four interviews with 5G experts to determine the impact of 5G technology on manufacturing performance. Lundgren et al. (2021) concluded that 5G in manufacturing will impact productivity, maintenance performance, and flexibility. Molino et al. (2021) conducted 14 focus groups with an Italian manufacturing company to determine the perceptions about Industry 4.0 and its transformations and investigate job antecedents of technology acceptance. Molino et al.'s (2021) results highlighted that supervisor support for new technologies and role clarity are essential to technological advancements. Rossini et al. (2021) conducted semi-structured interviews with 19 Italian manufacturing firms to determine if Industry 4.0 and lean production are successful matches for improving performance. Rossini et al. (2021) identified that sustaining people's involvement in digital transformation and the willingness to maintain continuous process

improvement implies a disruptive and radical change in the company system. Tortorella et al. (2017) conducted semi-structured interviews with lean experts across 225 lean experts in southern Brazil, finding that transient leadership style along lean management implementation is evidenced in task and relation orientation and may vary according to the hierarchical level. This study is built on those studies that focused on and identified leadership strategies and styles contributing to a business's ability to lead its organizations. It also identified human capital-focused actions and behaviors to assist leaders in finding the needed skill balance.

This study aimed to provide insights and strategies for business leaders in manufacturing companies by focusing on Ohio's greater Cleveland metropolitan area. It explored how these interviewed leaders' experiences can help others navigate the changing manufacturing landscape, embrace new technologies, and retain a skilled workforce. In recent years, Ohio's manufacturing sector has faced challenges such as globalization and automation, which have led to job losses and declines in production. This study was built on the premise that there was a leadership skills gap related to the advancement of technology in Cleveland area manufacturing firms.

The results of the interview ended up being antithetical to the original premise. The business leaders interviewed had the technological-based and leadership skills to lead their organizations with only the issue of finding the correct balance of the skill sets. The problems across all interviews related to problems or issues included labor issues and desired hiring attributes, issues/changes caused by technology, and private equity. The 64 comments coded equaled 15.6% related to labor issues and desired hiring attributes, issues/changes caused by technology, and private equity. Revisiting interview #18, who noted, “a limited people are willing to do, that will do high repetitive manual labor is very few and far between anymore. And even if you get a good one, the next challenge is retention. Retention has been horrible”

(Personal Interview #18, May 1, 2024). The Manufacturing Advocacy and Growth Network (MAGNET), a State of Ohio manufacturing, noted in a 2021 study that there is a talent time bomb where almost 60% of Northeast Ohio manufacturers said they could not find the skilled workers they need to grow (MAGNET, 2021). This same information was reported by those interviewed in this study. Rachel (2021) wrote about the labor shortage issue in a November 2021 article in Crain's Cleveland Business, noting that there is an immediate and widespread labor shortage and that manufacturing companies are in a culture of constant hiring. The article continued by noting that manufacturing has two big challenges related to labor: attracting new employees and having the required technical skills (Rachel, 2021). Breckenridge (2023) noted in a May 18, 2023 article that Cleveland's manufacturing sector had 10,000 open jobs and referenced a statistic from the National Association of Manufacturers estimating that by 2030, there will be two million openings in the United States total. Both of these recent news articles support the outcomes of this research. Understanding the intersection of technology, leadership, and viable labor in manufacturing is crucial for preparing the manufacturing industry for future challenges and success.

Future research can build on this study by focusing on the effects of technology on leadership in different geographic regions of the American manufacturing belt. Understanding Cleveland's manufacturing history provides valuable insights into the broader narrative of industrial development in the United States. Continuing future research can focus on variables of the main problem of this research, which was based on the recruitment, onboarding, and retention of manufacturing labor. Exploring future labor trends can include variables based on geographic and cultural views, views of manufacturing based on demographics, and the impact of the gamification process on retention. The other consideration of future research is the impact

of selling a small to medium-sized business to a private equity firm on employee engagement. By addressing the outlined research areas, academic researchers and technology analysts can contribute valuable insights that will shape the future of manufacturing. For those interested in pursuing these topics further, collaboration with industry experts and continuous monitoring of technological advancements will be essential.

In summary, the actions and behaviors uncovered through the research interviews underscore that while technology is an essential tool in modern leadership, human capital still takes precedence in these manufacturing businesses. The insights gathered reveal that there may not be a significant gap in technology leadership skills; the challenge lies in striking the right balance between leveraging staff capabilities and labor issues and integrating technological advancements. Effective leadership ultimately hinges on harmonizing these elements, ensuring that human and technological resources are utilized to their fullest potential.

Application to Professional Practice

The results of this study can improve business practices at manufacturing firms and provide strategies manufacturing leaders can implement to help their organizations adapt to changes due to emerging technology. Creswell and Poth (2013) noted that qualitative research strives for a greater understanding and deep knowledge structure by working with participants, readers, and themselves to obtain detailed meanings to research questions. In nine of 13 interviews, this research showed that applying professional knowledge and skills is paramount for long-term business efficiency and success in today's rapidly evolving manufacturing sector. Leaders who integrate employee engagement, clearly communicate expectations, develop employees, and drive technology into their operations enhance production efficiency and foster a more agile and innovative workforce. This shift drives manufacturing to new heights as leaders

leverage human capital to utilize advanced data analytics and automation to develop more efficient and streamlined manufacturing processes.

Improving General Business Practice

Manufacturing leaders can improve their general business practices by integrating employee engagement, clearly communicating expectations, developing employees, and driving technology into their operations. These actions can enhance production efficiency and foster a more agile and innovative workforce. This next section will discuss how these leaders can integrate employee engagement, clearly communicate expectations, develop employees, and drive technology into their organizations.

McCarthy et al. (2021) referred to an organizational position of a digital landscaper who works to improve the employee experience through engagement and creates a digital workplace to leverage technical resources to deliver innovative employee experience and engagement. Afsar and Umrani (2020) and Heckscher (2021) noted that employee engagement is crucial for improving team innovation, increasing productivity, and maintaining a positive work environment. Manufacturing leaders can foster engagement by providing opportunities for feedback, recognizing achievements, and creating a culture of mutual respect. Regular team-building activities and open communication channels can also help keep employees motivated and committed to their roles. The importance of leveraging technology in employee engagement and experience was also echoed by Bailey (2022), who call emerging technology a core component, and everyone, including business leaders, is a technology theorist. In this context, the leader using technology to focus on the employee resembles a technology-driven version of servant leadership. Servant leadership is a holistic approach that engages followers on many dimensions, including relational, ethical, emotional, and spiritual levels, allowing the follower to

grow (Eva et al., 2019). Five interviewed individuals discussed servant leadership as part of this research and the importance of working for their employees and supporting their professional and personal growth.

Clear communication of expectations is essential for ensuring everyone in the organization understands the direction of the organization and their roles and responsibilities in the business. Manufacturing leaders need to model the behavior desired by those in their organization. Peifer et al. (2022) noted that leaders need to be shapers of the change process, providing clear objectives and vision, and their competencies will be tested due to the changing environment, making it harder to provide clear direction. Communicating expectations from leadership was the second highest-rated coded item in this research, with 10.8% and 45 comments. Fifteen of 18 interviews stated the importance of direct communication with those on their show floor. Interview #12 highlighted the importance of communication, stating:

> Just communication. Communicating with the guys on a daily basis, verbally. Whether it be about the job or even about home life as well. So making sure you actually listen to the employees. And not just assume what's going on. I think that's a big thing across any job that you come across. I think a lot of people get overlooked. With their skill sets and knowledge base. And that really plays poorly on their effort towards the business. (Personal Interview #12, April 11, 2024)

Employee development also overlaps with employee engagement because a leader must focus on engaging people to develop them, which develops the organization. Investing in employee development is critical to maintaining a skilled and capable workforce. Manufacturing leaders can offer training programs, mentorship opportunities, and career advancement paths to help employees grow professionally. Interview #8 was a director of operations and touched on

the importance of employee development as leaders, stating that they no longer spend much time spreading and reporting and view their role as developing people and getting them to see the organization's vision. Developing employee skills contributes more effectively to the organization, makes employees feel more valued, and improves job satisfaction.

Adopting new technologies can significantly enhance operational efficiency and innovation in manufacturing. Driving technology differed from business to business in this research, with some being senior leader-driven while others had a continuous improvement team. In many instances, driving technology requires leader engagement in the process. Kretschmer and Khashabi (2020) indicated that organizations' extensive adoption of digital technology has resulted in a profound shift that could impact many businesses' internal operations and procedures. By categorizing and examining the impact on the method of output generation in organizations, these researchers create a comprehensive picture of how the digital revolution influences organizational design in both a positive and negative fashion. Leaders should stay abreast of emerging tech trends and invest in tools and systems that can automate processes, improve precision, and reduce downtime. Incorporating advanced technology, robotics, and machine learning technologies in their manufacturing process allows more agile and responsive to market demands.

Leaders who desire to improve their general business practices should articulate goals clearly, set measurable targets, and provide continuous feedback to keep employees on track. This transparency helps align individual efforts with the company's objectives and reduces misunderstandings and errors. Integrating these practices, manufacturing leaders can create a more efficient, innovative, and motivated workforce, ultimately driving success and growth for their organizations. Additionally, leaders need to foster a culture of continuous improvement and

encourage employees to share their ideas and suggestions for enhancing operations. These actions and behaviors promote employee engagement and allow the organization to identify potential areas for improvement and stay competitive in the constantly evolving manufacturing industry. Leaders play a crucial role in this process, empowering their teams to be proactive and innovative.

Potential Application Strategies

The study found that leaders who integrate employee engagement, clearly communicate expectations, develop employees, and drive technology into their operations enhance production efficiency and foster a more agile and innovative workforce. A vital aspect is that the leader's skillset and understanding of technology and human capital are essential in transforming the organization. As seen today, it is not the technology but the humans who use it; they should always do a 360-degree impact assessment, mitigating negatives—which all technology will possess. A potential application that organizations can use to leverage the findings mirrors the conceptual framework of this study. The conceptual framework for this study is based on the concept that to reduce the leadership skills set gap, a leader needs to understand transformational leadership, adaptive leadership theory, and situational leadership approach. These three principles create the potential application organizations can use to change and leverage people and technology for a firm's revenue and future opportunities.

Transformational leadership influences an employee's innovative work behavior, noting that the leader's attention to supporting their engagement can directly relate to increasing innovation and creative activities (Afsar & Umrani, 2020). Afsar and Umrani's (2020) work supports Northouse's (2019) thoughts that the leaders' skill set is essential in transforming an organization and assumes transformational leadership, in turn, helps an organization with

technological adaptation as it emerges. Interview #16 of this research discussed how they believe building relationships with employees is the biggest thing in employee engagement, stating,

> Firmly believing that a team, when it is operating well, should be more than the sum of its parts. You lose a lot of creativity and problem-solving, and the only way to make that work is to build relationships personally with people and then get them to build relationships between them. (Personal Interview #16, May 1, 2024)

These results indicate that feedback considerably enhances employee engagement, further supporting the case for using feedback in employee engagement and development.

The next concept for a potential application strategy is applying adaptive leadership techniques. Manufacturing leaders face difficulty enabling their organizations and human resources to adapt to today's dynamic and demanding business environment. Ohlsson et al. (2020) also contended that rapid developments in today's business environment, such as the globalization of the workforce, increased usage of virtual connections, and technical advancements, are placing increasing pressure on businesses and leaders to be adaptive. Alat and Suar (2020) explored leader flexibility in the manufacturing sector to understand the nature of uncertainties that leaders face and how their attributes facilitate them in responding to uncertain situations. Manufacturing businesses rely on their workforce's efficiency, skill, and ability to adapt to both established methods while embracing the automated methods emerging with advanced technology. In parallel to the reliance on the workforce's ability, those interviewed also discussed the importance of organizational development and a step plan for adapting to emerging technology.

Situational leadership is the last concept that should be part of a business's potential application strategy. Aslam et al. (2022) offered businesses theoretical support and practical

guidance for developing situational leadership and reducing employee burnout to boost motivation and job satisfaction. Situational leadership is a powerful approach in the manufacturing sector, offering operational flexibility that enhances team performance and productivity. Managers can effectively motivate their teams and drive results by utilizing different leadership styles to meet employees' specific needs and the demands of various situations (Hersey et al., 2013). This adaptability of the leader is crucial in a fast-paced manufacturing environment, where challenges and priorities can change rapidly. Implementing situational leadership fosters collaboration and continuous improvement, ultimately leading to better outcomes for the workforce and the organization.

As technology advances rapidly, leaders must develop application strategies focusing on employee engagement, clearly communicating expectations, developing employees, and driving technology into their operations. These application strategies are accomplished by understanding transformational leadership, adaptive leadership theory, and situational leadership approaches to evolve, lead their organizations, and find the needed balance between people and technology. Integrating technology in manufacturing leadership is a game-changer, enabling companies to remain competitive and responsive in a rapidly evolving market. The integration of technology also promotes a more agile workforce. Employees can adapt quickly to new systems and processes, increasing productivity and innovation.

Summary of Applications to Professional Practice

In summary, manufacturing leaders who understand the application of employee engagement, clearly communicate expectations, develop employees, and drive technology into their operations enhance production efficiency and foster a more agile and innovative workforce. The human element is critical to integrating technology into manufacturing to stay competitive,

increase revenue, and develop future opportunities. Employee engagement and development promote agility and innovation, improve resource management, foster collaboration, and enable companies to stay ahead of market trends. As technology advances rapidly, manufacturing leaders must embrace and utilize these advancements to drive company success. So, it is crucial for leaders to continuously research and implement new technologies to stay relevant and thrive in the ever-evolving manufacturing industry.

Additionally, companies should invest in training their employees to effectively using these technologies to maximize their benefits and improve productivity. By embracing technology, manufacturing companies can strive towards continuous improvement and growth while meeting the demands of an increasingly competitive market. Ultimately, technology is not meant to replace humans in manufacturing but to enhance their capabilities and create a more efficient and innovative workforce.

Recommendation for Future Study

The results of the interview ended up being antithetical to the original premise. The business leaders interviewed had the technological-based and leadership skills to lead their organizations with only the issue of finding the correct balance of the skill sets. The problems across all interviews related to problems or issues included labor issues and desired hiring attributes, issues/changes caused by technology, and private equity. Similar studies from the literature findings were Lundgren et al. (2021), Molino et al. (2021), Rossini et al. (2021), and Tortorella et al. (2017), which used some form of interviews or focus groups on their studies to assess the impact of technology on manufacturing businesses.

Future Research

Future research can build on this study by focusing on the effects of technology on leadership by conducting interviews in different geographic regions of the American manufacturing belt. When the researcher's goal is to understand better the participant's unique perspective on a topic rather than a generalized understanding of a phenomenon, semi-structured interviews are the preferred data collection method (Adeoye-Olatunde & Olenik, 2021). Adeoye-Olatunde and Olenik (2021) noted that semi-structured research allows the researcher greater liberty to explore pertinent ideas discovered during the interviews. Continuing future research can focus on variables of the main problem of this research, which was based on the recruitment, onboarding, and retention of manufacturing labor. Exploring future labor trends can include variables based on geographic and cultural views, views of manufacturing based on demographics, and the impact of the gamification process on retention.

The other consideration of future research is the impact of selling a small to medium-sized business to a private equity firm on employee engagement. By addressing the outlined research areas, academic researchers and technology analysts can contribute valuable insights that will shape the future of manufacturing. For those interested in pursuing these topics further, collaboration with industry experts and continuous monitoring of technological advancements will be essential.

Reflections

This academic pursuit began as a journey to use this work and words to advance God's purpose in the world. Reflecting on research is crucial for fostering learning and growth in any academic or professional field. Research reflection allows individuals to critically analyze their findings, methodologies, and overall experiences, leading to deeper insights and enhanced

understanding. Reflecting on one's research, individuals can identify potential areas for improvement and seek feedback from others in the field. This reflection enhances the quality of their work and fosters a sense of community and knowledge-sharing among researchers.

Personal and Professional Growth

Doctoral research is a transformative experience that fosters personal and professional growth. Boone et al. (2020) found that a median of 50% of students who enter a doctoral program fail to complete the program. Ghoston et al. (2020) and Van der Linden et al. (2018) supported this statistic with similar numbers of 50% and 57%, respectively. The rigorous demands of this level of study push the researcher to develop a level of performance and endurance both mentally and physically. Adapting to new critical thinking and problem-solving skills was essential in the doctoral journey. Aydın and Michou (2019) noted that academic buoyancy is the student's ability to bounce back from setbacks and difficulties. The article expanded the academic buoyancy description and identified factors that can help academic advisors predict a researcher's success and doctoral persistence, including self-efficacy, control beliefs, personal discipline, and personal achievement goals (Aydın & Michou, 2019).

Beyond academics, the process required self-discipline and resilience, teaching the researcher to overcome challenges and setbacks while never giving up. Additionally, the collaborative nature of conducting face-to-face interviews led to valuable networking opportunities with new leaders in the local manufacturing sector, and it is believed that many will remain lasting business associates for years to come. Connecting with these senior leaders and middle managers, who are experts, provided valuable knowledge and guidance on the uniqueness of each business and the universal leadership skills of focusing on people. The benefit of focusing on engaging and developing people is to be able to adapt to new technology,

which ultimately drives technological advancements. Ultimately, the insights gained from doctoral research continue to advance and refine the researcher's knowledge of leadership fundamentals and cultivate essential life skills that will benefit both personal development and professional aspirations for years to come.

The personal sacrifice to accomplish this pursuit was great, and this verse was at the forefront of this academic journey. Romans 5:3-5 states:

> Not only so, but we also glory in our sufferings, because we know that suffering produces perseverance; perseverance, character; and character, hope. And hope does not put us to shame, because God's love has been poured out into our hearts through the Holy Spirit, who has been given to us. (*New International Version*, 2011, Romans 5:3-5)

The Bible speaks of determination and strength in James 1:12, stating, "Blessed is the one who perseveres under trial because, having stood the test, that person will receive the crown of life that the Lord has promised to those who love him" (*New International Version,* 2011, James 1:12). The personal growth is that my faith in Christ is stronger and the belief that this pursuit will ultimately be used to advance God's will in the business world gives me satisfaction in accomplishing this pursuit.

Biblical Perspective

When integrated into business, the Christian Faith can transform the modern world. Christians understand the hope that the truth of the scriptures provides a new perspective on every business sector, vocation, and worldview. The Gospel's transformative power allows us to see everything in a new light, inspiring hope and optimism in the face of modern challenges that emerging technology creates. By understanding the relationship between internal and external

factors in an organization, manufacturing leaders can use this transformative power to make the world a better place for human resources and promote the advancement of God's purpose.

Those interviewed for this research consistently prioritized people as their most important asset. Still, there was a noticeable difference in these businesses that directly brought up their faith in their interviews. Within their offices or manufacturing areas, they had faith-based flyers or posters within the building outwardly displaying their expectations. They genuinely cared for their people. That faith is believed to have a different worldview than other business leaders and a calling to care for their employees differently. That echoes the statement from one business owner on developing their people: “Ultimately, if you are about growing people and, you know, and that is my whole thing. If we grow people spiritually, mentally, and emotionally, they will make a phenomenal product” (Personal Interview #3, March 4, 2024). Mark 10:45 discussed how "the Son of Man did not come to be served, but to serve" (*New International Version*, 2011, Mark 10:45). The desire to serve as Christ served others is the key foundational idea to be successful in a manufacturing business or life.

Qualitative data cannot be developed from that owner's statement. Still, he believed that Biblical-based business principles of caring for people made his business produce a better product and be more profitable. That business openly spreads God's love every day through the manufacturing of products. The light of the Gospel allows Christians to understand that God is sovereign over all businesses and organizations and that our actions and behaviors should mirror this light of hope.

Engaging and developing people out of Christ's love can be that new light that shines on our deficiencies and weaknesses and promotes a Biblical worldview. That new light is hope, and in hope, we all know to “Commit your work to the Lord, and he will establish your plans” (*New*

International Version, 2011, Proverbs 16:3). Interview #15 also highlighted the importance of servitude in leadership, stating that their organization's main go-to for employee engagement is servant leadership.

> Management's primary focus is to lead by example and not point blame when issues arise in the production flow; instead, they work together to find solutions to the problem. They also stated that their main leadership mantra is to seek to understand before seeking to be understood. (Personal Interview #15, May 1, 2024)

Interview #4 was the operations manager to interview #3 and mirrored the owner's example, stating, “You know. Basically, we are here to serve others. You know, we have a servant leadership philosophy here” (Personal Interview #4, March 4, 2024).

In the context of this research, business owners need to be good stewards of first the people and second the technology they are stewarding. Good stewards of their business are spiritual, rational, moral, social, and provide physical examples for Christ by modeling a positive image of God. Believers need to remember that in all “advancement in learning, every work of art, every innovation in health care or technology, or management or governess is simply God opening his book of creating and revealing his truth” (Keller & Alsdorf, 2012, p. 157). In contemporary times, being a good steward equates to continuous improvement and improving the quality of a business's products and services through efficiency in its operation. Generating those products and services creates revenue that can be used to advance God's purpose in the world. As a Christian, work should not be sought to bring glory and praise for the individual but “see work as a way of service to God” (Keller & Alsdorf, 2012, p. 52).

Summary of Reflections

In summary, research reflection is an essential aspect of conducting high-quality research. This academic pursuit began with the journey of using this work and words to advance God's purpose in the world. Conducting research can be like working under the grievous sun performing meaningless tasks. Research can be daunting as one develops the plans, develops, implements, and crafts content to develop a tangible product. The uniqueness of Christians is the understanding of the transcendence and necessity of God in their lives (Keller & Alsdorf, 2012). Keller and Alsdorf (2012) continued that nothing in this world is a sufficient basis for a meaningful life, and our endeavor in life is a gracious gift from our Creator that shows us a way to have an unshakeable, purposeful life. Research reflection is an integral part of the research process of learning. It involves the whole person developing the knowledge, values, and skills that enable personal growth, encourage collaboration, and drive innovation.

Summary of Section 3

In summary, this research focused on the effects of advanced technology on the business sector, with emerging technology being developed at an accelerated rate, causing a gap in leadership skills compared to the speed of technological advancement. The interview participants of this study were senior organizational and middle-management leaders and front-line contributors in Ohio's greater Cleveland metropolitan area manufacturing businesses. Actions and behaviors uncovered through the research interviews underscore that while technology is an essential tool in modern leadership, human capital still takes precedence in these manufacturing businesses.

Manufacturing leaders who understand the application of employee engagement, clearly communicate expectations, develop employees, and drive technology into their operations

enhance production efficiency and foster a more agile and innovative workforce. The human element is critical to integrating technology into manufacturing to stay competitive, increase revenue, and develop future opportunities. The insights gathered reveal that there may not be a significant gap in technology leadership skills; the challenge lies in striking the right balance between leveraging staff capabilities and labor issues and integrating technological advancements. Effective leadership ultimately hinges on harmonizing these elements, ensuring that human and technological resources are utilized to their fullest potential.

Summary and Study Conclusions

Invention has been the catalyst for societal advancement, altering human occupations, changing the business world, and bringing geographically separated societies closer. This study identified the effects of advanced technology on the manufacturing sector as emerging technology accelerates, causing a gap in leadership skills compared to the speed of technological advancement. Through case study, this research looked at the impact of advanced technologies on business leadership—digital transformation reshaping every aspect of the business world, including the people, processes, and platforms. in Ohio's greater Cleveland metropolitan area manufacturing companies. The research showed that business owners who are good stewards of first the people and second the technology they are stewarding. Manufacturing leaders who understand the application of employee engagement, clearly communicate expectations, develop employees, and drive technology into their operations enhance production efficiency and foster a more agile and innovative workforce. The human element is critical to integrating technology into manufacturing to stay competitive, increase revenue, and develop future opportunities. Employee engagement and development promote agility and innovation, improve resource management, foster collaboration, and enable companies to stay ahead of market trends. As

technology advances rapidly, manufacturing leaders must embrace and utilize these advancements to drive company success. It is crucial for leaders to continuously research and implement new technologies to stay relevant and thrive in the ever-evolving manufacturing industry. Leaders whose actions and behaviors blend technical and leadership skills understand that human capital is the main drive to success in a manufacturing business.

References

Abhishek, V., Guajardo, J. A., & Zhang, Z. (2021). Business models in the sharing economy: Manufacturing durable goods in the presence of peer-to-peer rental markets. *Information Systems Research*, *32*(4), 1450–1469. https://doi.org./10.1287/isre.2021.1034

Adebayo, A., & Ackers, B. (2021). Sampling theoretically for comparison. *Electronic Journal of Business Research Methods*, *19*(1), 42–56. https://doi.org/10.34190/ejbrm.19.1.2434

Adeoye-Olatunde, O. A., & Olenik, N. L. (2021). Research and scholarly methods: Semi-structured interviews. *Journal of the American College of Clinical Pharmacy*, *4*(10), 1358–2367. https://doi.org/10.1002/jac5.1441

Afsar, B., & Umrani, W. A. (2020). Transformational leadership and innovative work behavior. *European Journal of Innovation Management*, *23*(3), 402–428. https://doi.org./10.1108/EJIM-12-2018-0257

Agrawal, A., Gans, J. S., & Goldfarb, A. (2019). Artificial intelligence. *The Journal of Economic Perspectives*, *33*(2), 31–50. https://doi.org./10.1257/jep.33.2.31

Akdur, D. (2021). Skills gaps in the industry: Opinions of embedded software practitioners. *ACM Transactions on Embedded Computing Systems*, *20*(5), 1–39. https://doi.org/10.1145/3463340

Alat, P., & Suar, D. (2020). Flexible leadership in the manufacturing sector. *International Journal of Organization Theory and Behavior*, *23*(1), 23–42. https://doi.org./10.1108/IJOTB-08-2018-0093

Ali, A., Wang, H., & Johnson, R. E. (2020). Empirical analysis of shared leadership promotion and team creativity: An adaptive leadership perspective. *Journal of Organizational Behavior*, *41*(5), 405–423. https://doi.org./10.1002/job.2437

Andrade, C. (2021). The inconvenient truth about convenience and purposive samples. *Indian Journal of Psychological Medicine*, *43*(1), 86–88. https://doi.org/10.1177/0253717620977000

Andriole, S. (2021). Business technology trends + lists + awareness = executive optimization. *IT Professional*, *23*(3), 107–109. https://doi.org./10.1109/MITP.2021.3064141

Asadi, R., & Stefanescu, D. (2019). The sustainable links of development between leadership and organizational cultures. *Journal of Economic Development, Environment, and People*, *8*(2), 45–55. https://doi.org/10.26458/jedep.v8i2.626

Aslam, S., Saleem, A., Kumar, T., & Parveen, K. (2022). New normal: Emergence of situational leadership during COVID-19 and its impact on work motivation and job satisfaction. *Frontiers in Psychology*, *13*, 919941. https://doi.org/10.3389/fpsyg.2022.919941

Aydın, G., & Michou, A. (2019). Self-determined motivation and academic buoyancy as predictors of achievement in normative settings. *British Journal of Educational Psychology*, *90*(4), 964–980. https://doi.org/10.1111/bjep.12338

Aylward, R. C., & Cronjé, J. C. (2022). Paradigms extended: How to integrate behaviorism, constructivism, knowledge domain, and learner mastery in instructional design. *Educational Technology Research and Development*, *70*(2), 503–529. https://doi.org/10.1007/s11423-022-10089-w

Ayoko, O. B. (2021). Resiliency and leadership in organizations. *Journal of Management & Organization*, *27*(3), 417–421. https://doi.org./10.1017/jmo.2021.44

Bailey, D. E. (2022). We are all theorists of technology now: A relational perspective on emerging technology and organizing. *Organization Science (Providence, R.I.)*, *33*(1), 1–18. https://doi.org./10.1287/orsc.2021.1562

Ballestar, M. T., Díaz-Chao, Á., Sainz, J., & Torrent-Sellens, J. (2021). Impact of robotics on manufacturing: A longitudinal machine learning perspective. *Technological Forecasting & Social Change, 162*, 120348. https://doi.org/10.1016/j.techfore.2020.120348

Bendig, D., Wagner, R., Jung, C., & Nüesch, S. (2022). When and why technology leadership enters the C-suite: An antecedents perspective on CIO presence. *The Journal of Strategic Information Systems, 31*(1), 101705. https://doi.org./10.1016/j.jsis.2022.101705

Bleich, M. R. (2021). A development challenge: Embracing technology in leadership development. *The Journal of Continuing Education in Nursing*, *52*(6), 260–262. https://doi.org./10.3928/00220124-20210514-03

Bogna, F., Raineri, A., & Dell, G. (2020). Critical realism and constructivism: Merging research paradigms for a deeper qualitative study. *Qualitative Research in Organizations and Management, 15*(4), 461–484. https://doi.org/10.1108/QROM-06-2019-1778

Boone, S. C., De Charon, L., Hill, M., Preiss, A., Ritter-Williams, D., & Young, E. (2020). Doctoral student persistence and progression: A program assessment. *Journal of Applied Research in Higher Education, 12*(4), 753–765. https://doi.org/10.1108/JARHE-07-2019-0192

Bragger, J. D., Alonso, N. A., D'Ambrosio, K., & Williams, N. (2021). Developing leaders to serve and servants to lead. *Human Resource Development Review*, *20*(1), 9–45. https://doi.org./10.1177/1534484320981198

Braun, V., & Clarke, V. (2021). To saturate or not to saturate? Questioning data saturation as a useful concept for thematic analysis and sample-size rationales. *Qualitative Research in Sport, Exercise and Health, 13*(2), 201–216. https://doi.org/10.1080/2159676X.2019.1704846

Breckenridge, T. (2023, May 18). *Cleveland manufacturers can't find employees, so nonprofits step in to boost training and internships*. The Land. https://thelandcle.org/stories/cleveland-manufacturers-cant-find-employees-so-nonprofits-step-in-to-boost-training-and-internships/

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: Complex or simple? Research case examples. *Journal of Research in Nursing*, *25*(8), 652–661 https://doi.org/10.1177/1744987120927206

Cantú-Ortiz, F. J., Galeano Sánchez, N., Garrido, L., Terashima-Marin, H., & Brena, R. F. (2020). An artificial intelligence educational strategy for the digital transformation. *International Journal on Interactive Design and Manufacturing*, *14*(4), 1195–1209. https://doi.org./10.1007/s12008-020-00702-8

Card, D., & Nelson, C. (2019). How automation and digital disruption are shaping the workforce of the future. *Strategic HR Review*, *18*(6), 242–245. https://doi.org./10.1108/SHR-08-2019-0067

Casteel, A., & Bridier, N. (2021). Describing populations and samples in doctoral student research. *International Journal of Doctoral Studies*, *16*, 339–362. https://doi.org/10.28945/4766

Claassen, K., Dos Anjos, D. R., Kettschau, J., & Broding, H. C. (2021). How to evaluate digital leadership: A cross-sectional study. *Journal of Occupational Medicine and Toxicology (London, England)*, *16*(1), 44–51. https://doi.org./10.1186/s12995-021-00335-x

Cobern, W., & Adams, B. (2020). When interviewing: How many is enough? *International Journal of Assessment Tools in Education*, *7*(1), 73–79. https://doi.org/10.21449/ijate.693217

Cohrs, C., Bormann, K. C., Diebig, M., Millhoff, C., Pachocki, K., & Rowold, J. (2020). Transformational leadership and communication: Evaluation of a two-day leadership development program. *Leadership & Organization Development Journal*, *41*(1), 101–117. https://doi.org./10.1108/LODJ-02-2019-0097

Coleman, P. (2022). Validity and reliability within qualitative research for the caring sciences. *International Journal of Caring Sciences*, *14*(3), 2041–2045. https://oro.open.ac.uk/81588/

Collings, D. G., Nyberg, A. J., Wright, P. M., & McMackin, J. (2021). *Leading through paradox in a COVID-19 world: Human resources comes of age*. Wiley. https://doi.org./10.1111/1748-8583.12343

Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative and qualitative approaches to research.* Merrill/Pearson Education.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage.

Dachs, B., Kinkel, S., & Jäger, A. (2019). Bringing it all back home? Backshoring of manufacturing activities and the adoption of Industry 4.0 technologies. *Journal of World Business, 54*(6), 101017. https://doi.org./10.1016/j.jwb.2019.101017

Denzin, N. K. (2017). *The research act: A theoretical introduction to sociological methods*. McGraw-Hill.

Dörfler, V., & Stierand, M. (2021). Bracketing: a phenomenological theory applied through transpersonal reflexivity. *Journal of Organizational Change Management*, *34*(4), 778–793. https://doi.org/10.1108/JOCM-12-2019-0393

Douglas, S., Merritt, D., Roberts, R., & Watkins, D. (2022). Systemic leadership development: Impact on organizational effectiveness. *International Journal of Organizational Analysis*, *30*(2), 568–588. https://doi.org./10.1108/IJOA-05-2020-2184

Ellingson, L. L., & Sotirin, P. (2020). Data engagement: A critical materialist framework for making data in qualitative research. *Qualitative Inquiry*, *26*(7), 817–826. https://doi.org/10.1177/1077800419846639

Esmene, S., & Kirsop-Taylor, N. (2021). External disruptions to qualitative data collection: Addressing risks relating to Brexit and researcher-participant rapport. *Qualitative Report*, *26*(3), 795–807. https://doi.org/10.46743/2160-3715/2021.4434

Eva, N., Robin, M., Sendjaya, S., van Dierendonck, D., & Liden, R. C. (2019). Servant leadership: A systematic review and call for future research. *The Leadership Quarterly*, *30*(1), 111–132. https://doi.org/10.1016/j.leaqua.2018.07.004

Farahnak, L. R., Ehrhart, M. G., Torres, E. M., & Aarons, G. A. (2020). The influence of transformational leadership and leader attitudes on subordinate attitudes and implementation success. *Journal of Leadership & Organizational Studies*, *27*(1), 98–111. https://doi.org/10.1177/1548051818824529

Farquhar, J., Michels, N., & Robson, J. (2020). Triangulation in industrial qualitative case study research: Widening the scope. *Industrial Marketing Management, 87*, 160–170. https://doi.org./10.1016/j.indmarman.2020.02.001

Fatien Diochon, P., & Nizet, J. (2019). Re-embedding leadership development: Exploring power dynamics to understand the insensitivity of coaching programs to organizational contexts. *Leadership (London, England)*, *15*(5), 603–620. https://doi.org./10.1177/1742715018824442

Favoretto, C., Mendes, G. H. d. S., Filho, M. G., Gouvea de Oliveira, M., & Ganga, G. M. D. (2022). Digital transformation of business model in manufacturing companies: Challenges and research agenda. *The Journal of Business & Industrial Marketing*, *37*(4), 748–767. https://doi.org./10.1108/JBIM-10-2020-0477

Florczak, K. L. (2021). Reflexivity: Should it be mandated for qualitative reporting? *Nursing Science Quarterly*, *34*(4), 352–355. https://doi.org/10.1177/08943184211031593

Fogarty, M. S., Garofalo, G. S., & Hammack, D. C. (2002). *Cleveland from startup to the present: Innovation and entrepreneurship in the 19th and early 20th century*. Center for Regional Economic Issues, Weatherhead School of Management, Case Western Reserve University.

Gartner Inc. (2023). *The top 5 priorities for HR leaders in 2023.* Gartner. https://www.gartner.com/en/webinar/423847/989926

Ghoston, M., Grimes, T., Graham, J., Field, T. A., & Grimes, J. (2020). Faculty perspectives on strategies for successful navigation of the dissertation process in counselor education. *The Professional Counselor (Greensboro, N.C.)*, *10*(4), 615–631. https://doi.org/10.15241/mg.10.4.615

Gilad, S. (2021). Mixing qualitative and quantitative methods in pursuit of richer answers to real-world questions. *Public Performance & Management Review*, *44*(5), 1075–1099. https://doi.org/10.1080/15309576.2019.1694546

Gong, Q., Chen, G., Zhang, W., & Wang, H. (2022). The role of humans in flexible smart factories. *International Journal of Production Economics*, *254*, 108639. https://doi.org/10.1016/j.ijpe.2022.108639

Gottfredson, R. K., & Reina, C. S. (2021). Illuminating the foundational role that mindsets should play in leadership development. *Business Horizons*, *64*(4), 439–451. https://doi.org/10.1016/j.bushor.2021.02.009

Grocutt, A., Gulseren, D., Weatherhead, J. G., & Turner, N. (2020). Can mentoring programmes develop leadership? *Human Resource Development International*, *25*(4), 404–414. https://doi.org./10.1080/13678868.2020.1850090

Gupta, M., Behl, A., & Kumar, Y. (2021). "Prevention is better than cure": Challenges in engaging employees through gamification. *International Journal of Manpower*, *43*(2), 380–394. https://doi.org/10.1108/ijm-03-2021-0172

Gutierrez, A., Orozco, J., & Serrano, A. (2009). Factors affecting IT and business alignment: A comparative study in SMEs and large organisations. *Journal of Enterprise Information Management*, *22*(1–2), 197–211. https://doi.org./10.1108/17410390910932830

Healey, R. G. (2014). Railroads, factor channeling and increasing returns: Cleveland and the emergence of the American manufacturing belt. *Journal of Economic Geography*, *15*(3), 499–538. https://doi.org/10.1093/jeg/lbu011

Heckscher, C. (2021). Changing demands on leadership. *Psychoanalytic Inquiry*, *41*(7), 494–503. https://doi.org./10.1080/07351690.2021.1971466

Hedge, C. (2021). Qualitative individual differences are useful, but reliability should be assessed and not assumed. *Journal of Cognition*, *4*(1), 48–. https://doi.org/10.5334/joc.169

Heesen, R., Bright, L. K., & Zucker, A. (2019). Vindicating methodological triangulation. *Synthese (Dordrecht), 196*(8), 3067–3081. https://doi.org/10.1007/s11229-016-1294-7

Henderikx, M., & Stoffers, J. (2022). An exploratory literature study into digital transformation and leadership: Toward future-proof middle managers. *Sustainability (Basel, Switzerland), 14*(2), 687. https://doi.org./10.3390/su14020687

Hennink, M., & Kaiser, B. N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine, 292*, 114523. https://doi.org/10.1016/j.socscimed.2021.114523

Hersey, P., Blanchard, K. H., & Johnson, D. E. (2013). *Management of organizational behavior: Utilizing human resources* (10th ed.). Prentice-Hall.

Hoorani, B. H., Nair, L. B., & Gibbert, M. (2019). Designing for impact: The effect of rigor and case study design on citations of qualitative case studies in management. *Scientometrics, 121*(1), 285–306. https://doi.org/10.1007/s11192-019-03178-w

Horrigan-Kelly, M., Millar, M., & Dowling, M. (2016). Understanding the key tenets of Heidegger's philosophy for interpretive phenomenological research. *International Journal of Qualitative Methods*, *15*(1), 160940691668063. https://doi.org/10.1177/1609406916680634

Howard, J. (2019). Artificial intelligence: Implications for the future of work. *American Journal of Industrial Medicine*, *62*(11), 917–926. https://doi.org./10.1002/ajim.23037

Husain, Z., Dayan, M., & Di Benedetto, C. A. (2022). Impact of customer focus on technology leadership via technology development capability – A moderated mediation model. *The Journal of Business & Industrial Marketing*, *37*(2), 282–293. https://doi.org./10.1108/JBIM-04-2020-0186

Huttunen, R., & Kakkori, L. (2020). Heidegger's theory of truth and its importance for the quality of qualitative research. *Journal of Philosophy of Education*, *54*(3), 600–616. https://doi.org/10.1111/1467-9752.12429

Ifenthaler, D., & Egloffstein, M. (2019). Development and implementation of a maturity model of digital transformation. *TechTrends*, *64*(2), 302–309. https://doi.org./10.1007/s11528-019-00457-4

Ilyana, S., & Sholihin, M. (2021). The effect of incentives and leadership styles on creative performance. *Journal of Indonesian Economy and Business*, *36*(1), 14–30. https://doi.org./10.22146/jieb.59893

Irshaidat, R. (2022). Interpretivism vs. positivism in political marketing research. *Journal of Political Marketing*, *21*(2), 126–160. https://doi.org/10.1080/15377857.2019.1624286

Jackson, N. C., & Dunn-Jensen, L. M. (2021). Leadership succession planning for today's digital transformation economy: Key factors to build for competency and innovation. *Business Horizons*, *64*(2), 273–284. https://doi.org./10.1016/j.bushor.2020.11

Jain, V., & Ajmera, P. (2021). Modelling the enablers of industry 4.0 in the Indian manufacturing industry. *International Journal of Productivity and Performance Management*, *70*(6), 1233–1262. https://doi.org./10.1108/IJPPM-07-2019-0317

James, L. R., Bennett, N., & Blum, T. C. (2021). To push performance, check the leader's power motive. *Business Horizons*, *64*(2), 181–188. https://doi.org./10.1016/j.bushor.2020.11.002

Jiang, X., Xu, S., Houghton, J. D., & Kulich, S. J. (2021). Leader self-development: Why do people develop themselves as leaders? *Business Horizons*, *64*(2), 239–248. https://doi.org./10.1016/j.bushor.2020.12.002

Kalsoom, T., Ramzan, N., Ahmed, S., & Ur-Rehman, M. (2020). Advances in sensor technologies in the era of smart factory and industry 4.0. *Sensors (Basel, Switzerland)*, *20*(23), 6783. https://doi.org/10.3390/s20236783

Kaushik, V., & Walsh, C. A. (2019). Pragmatism as a research paradigm and its implications for social work research. *Social Sciences (Basel)*, *8*(9), 255. https://doi.org/10.3390/socsci8090255

Keller, T., & Alsdorf, K. (2012). *Every good endeavor: Connecting your work to God's work.* Dutton/Penguin Group.

Kelly, L. M., & Cordeiro, M. (2020). Three principles of pragmatism for research on organizational processes. *Methodological Innovations*, *13*(2), 205979912093724. https://doi.org/10.1177/2059799120937242

Kennedy, A., Gorman, C., & Lee, K. (2021). Have your cake and eat it? Combining structure and agency in management research. *European Management Review*, *18*(4), 433–444. https://doi.org/10.1111/emre.12490

Kim, J., Kang, H., & Lee, K. (2021). Transformational-transactional leadership and unethical pro-organizational behavior in the public sector: does public service motivation make a difference? *Public Management Review*, *25*(2), 429–458. https://doi.org./10.1080/14719037.2021.1974714

Kinkel, S., Baumgartner, M., & Cherubini, E. (2022). Prerequisites for the adoption of AI technologies in manufacturing – Evidence from a worldwide sample of manufacturing companies. *Technovation*, *110*, 102375. https://doi.org./10.1016/j.technovation.2021.102375

Kolagar, M., Parida, V., & Sjödin, D. (2022). Ecosystem transformation for digital servitization: A systematic review, integrative framework, and future research agenda. *Journal of Business Research*, *146*, 176–200. https://doi.org./10.1016/j.jbusres.2022.03.067

Kretschmer, T., & Khashabi, P. (2020). Digital transformation and organization design: An integrated approach. *California Management Review*, *62*(4), 86–104. https://10.1177/0008125620940296

Kwiotkowska, A., Gajdzik, B., Wolniak, R., Vveinhardt, J., & Gębczyńska, M. (2021). Leadership competencies in making industry 4.0 effective: The case of Polish heat and power industry. *Energies (Basel)*, *14*(14), 4338. https://doi.org/10.3390/en14144338

Lavee, E., & Itzchakov, G. (2023). Good listening: A key element in establishing quality in qualitative research. *Qualitative Research*, *23*(3), 614–631. https://doi.org/10.1177/14687941211039402

Li, G., Yuan, C., Kamarthi, S., Moghaddam, M., & Jin, X. (2021). Data science skills and domain knowledge requirements in the manufacturing industry: A gap analysis. *Journal of Manufacturing Systems*, *60*, 692–706. https://doi.org./10.1016/j.jmsy.2021.07.007

Loucks, S., & Ozogul, G. (2020). Preparing business students for a distributed workforce and global business environment: Gaining virtual leadership skills in an authentic context. *TechTrends*, *64*(4), 655–665. https://doi.org./10.1007/s11528-020-00513-4

Lowe, A., Norris, A. C., Farris, A. J., & Babbage, D. R. (2018). Quantifying thematic saturation in qualitative data analysis. *Field Methods*, *30*(3), 191–207. https://doi.org/10.1177/1525822X17749386

Ludvigsen, M. S., Hall, E. O. C., Meyer, G., Fegran, L., Aagaard, H., & Uhrenfeldt, L. (2016). Using Sandelowski and Barroso's meta-synthesis method in advancing qualitative

evidence. *Qualitative Health Research*, *26*(3), 320–329. https://doi.org/10.1177/1049732315576493

Lundgren, C., Turanoglu Bekar, E., Bärring, M., Stahre, J., Skoogh, A., Johansson, B., & Hedman, R. (2021). Determining the impact of 5G technology on manufacturing performance using a modified TOPSIS method. *International Journal of Computer Integrated Manufacturing*, *35*(1), 6990. https://doi.org./10.1080/0951192X.2021.1972465

Luria, G., Kahana, A., Goldenberg, J., & Noam, Y. (2019). Leadership development: Leadership emergence to leadership effectiveness. *Small Group Research*, *50*(5), 571–592. https://doi.org/10.1177/1046496419865326

Magesa, M. M., & Jonathan, J. (2021). Conceptualizing digital leadership characteristics for successful digital transformation: the case of Tanzania. *Information Technology for Development*, *28*(4), 777–796. https://doi.org/10.1080/02681102.2021.1991872

MAGNET. (2021). *Introduces 'Make It Better: A blueprint for manufacturing in Northeast Ohio'* (2021). Close-Up Media, Inc.

Mahmood, F., Khan, A. Z., & Bokhari, R. H. (2019). ERP issues and challenges: A research synthesis. *Kybernetes*, *49*(3), 629–659. https://doi.org/10.1108/K-12-2018-0699

Malik, M. O., & Khan, N. (2020). Analysis of ERP implementation to develop a strategy for its success in developing countries. *Production Planning & Control*, *32*(12), 1020–1035. https://doi.org/10.1080/09537287.2020.1784481

Mallpress, D. E. (2022). Towards a functional classification of behaviour: A taxonomy based on outcomes. *Adaptive Behavior*, *30*(5), 417–450. https://doi.org/10.1177/10597123211040574

Martín-Peña, M., Sánchez-López, J., & Díaz-Garrido, E. (2019). Servitization and digitalization in manufacturing: The influence on firm performance. *The Journal of Business & Industrial Marketing*, *35*(3), 564–574. https://doi.org/10.1108/JBIM-12-2018-0400

Martínez-Climent, C., Rodríguez-García, M., & Zeng, J. (2019). Ambidextrous leadership, social entrepreneurial orientation, and operational performance. *Sustainability*, *11*(3), 890. https://doi.org/10.3390/su11030890

Massaro, M., Dumay, J., & Bagnoli, C. (2019). Transparency and the rhetorical use of citations to Robert Yin in case study research. *Meditari Accountancy Research*, *27*(1), 44–71. https://doi.org/10.1108/MEDAR-08-2017-0202

Matsunaga, M. (2021). Testing the theory of communication and uncertainty management in the context of digital transformation with transformational leadership as a moderator. *International Journal of Business Communication*, 23294884211023966. https://doi.org/10.1177/23294884211023966

Mbokota, G., & Reid, A. (2022). The role of group coaching in developing leadership effectiveness in a business school leadership development programme. *South African Journal of Business Management*, *53*(1), e1–e10. https://doi.org/10.4102/sajbm.v53i1.3105

McCahery, J., Vermeulen, E., & Fenwick, M. (2021). Will the world ever be the same after Covid-19?: Two lessons from the first global crisis of a digital age. *European Business Organization Law Review*, *22*(1), 125–145. https://doi.org/10.1007/s40804-020-00194-9

McCarthy, P., Sammon, D., & Alhassan, I. (2021). Digital transformation leadership characteristics: A literature analysis. *Journal of Decision Systems*, *32*(1), 79–109. https://doi.org/10.1080/12460125.2021.1908934

Megheirkouni, M., & Mejheirkouni, A. (2020). Leadership development trends and challenges in the twenty-first century: Rethinking the priorities. *The Journal of Management Development*, *39*(1), 97–124. https://doi.org/10.1108/JMD-04-2019-0114

Molino, M., Cortese, C. G., & Ghislieri, C. (2021). Technology acceptance and leadership 4.0: A qualitative-quantitative study. *International Journal of Environmental Research and Public Health*, *18*(20), 10845. https://doi.org/10.3390/ijerph182010845

Morse, J. M. (1999). Qualitative methods: The state of the art. *Qualitative Health Research*, *9*(3), 393–406. https://doi.org/10.1177/104973299129121938

Motulsky, S. L. (2021). Is member checking the gold standard of quality in qualitative research? *Qualitative Psychology (Washington, D.C.)*, *8*(3), 389–406. https://doi.org/10.1037/qup0000215

Mthuli, S. A., Ruffin, F., & Singh, N. (2022). 'Define, Explain, Justify, Apply' (DEJA): An analytic tool for guiding qualitative research sample size. *International Journal of Social Research Methodology*, *25*(6), 809–821. https://doi.org/10.1080/13645579.2021.1941646

Mutsuddi, I., & Sinha, R. (2022). Role of leadership skills for developing digital acumen in information technology employees. *Vision (New Delhi, India)*, *26*(2), 243–253. https://doi.org/10.1177/0972262920985955

Nair, K. (2019). Overcoming today's digital talent gap in organizations worldwide. *Development and Learning in Organizations*, *33*(6), 16–18. https://doi.org/10.1108/DLO-02-2019-0044

New International Version. (2011). Zondervan.

Newstead, T., Dawkins, S., Macklin, R., & Martin, A. (2021). We don't need more leaders – We need more good leaders. Advancing a virtues-based approach to leader(ship)

development. *The Leadership Quarterly*, *32*(5), 101312. https://doi.org/10.1016/j.leaqua.2019.101312

Ngayo Fotso, G. M. (2021). Leadership competencies for the 21st century: a review from the Western world literature. *European Journal of Training and Development*, *45*(6–7), 566–587. https://doi.org/10.1108/EJTD-04-2020-0078

Nguyen, D. C., & Tull, J. (2022). Context and contextualization: The extended case method in qualitative international business research. *Journal of World Business*, *57*(5), 101348. https://doi.org/10.1016/j.jwb.2022.101348

Nielsen, B. B., Welch, C., Chidlow, A., Miller, S. R., Aguzzoli, R., Gardner, E., Karafyllia, M., & Pegoraro, D. (2020). Fifty years of methodological trends in JIBS: Why future IB research needs more triangulation. *Journal of International Business Studies*, *51*(9), 1478–1499. https://doi.org/10.1057/s41267-020-00372-4

Northouse, P. G. (2019). *Leadership: Theory and practice* (8th ed.). Sage.

Ohlsson, A., Alvinius, A., & Larsson, G. (2020). Smooth power: Identifying high-level leadership skills promoting organizational adaptability. *International Journal of Organization Theory and Behavior*, *23*(4), 297–313. https://doi.org/10.1108/IJOTB-02-2019-0009

Pande, M., & Bharathi, S. V. (2020). Theoretical foundations of design thinking – A constructivism learning approach to design thinking. *Thinking Skills and Creativity*, *36*, 100637. https://doi.org/10.1016/j.tsc.2020.100637

Park, Y. (2021). A data-driven approach for discovery of the latest research trends in higher education for business by leveraging advanced technology and big data. *Journal of Education for Business*, *96*(5), 291–298. https://doi.org/10.1080/08832323.2020.1821344

Peifer, Y., Jeske, T., & Hille, S. (2022). Artificial intelligence and its impact on leaders and leadership. *Procedia Computer Science, 200,* 1024–1030. https://doi.org/10.1016/j.procs.2022.01.301

Princes, E., & Said, A. (2022). The impacts of project complexity, trust in leader, performance readiness and situational leadership on financial sustainability. *International Journal of Managing Projects in Business*, *15*(4), 619–644. https://doi.org/10.1108/IJMPB-03-2021-0082

Qiu, M., Xu, Y., & Omojokun, E. O. (2020). To close the skills gap, technology and higher-order thinking skills must go hand in hand. *Journal of International Technology and Information Management*, *29*(1), 98–123. https://doi.org/10.58729/1941-6679.1444

Rachel, A. M. (2021). Filling skills gap even more difficult for manufacturers: Tight labor market hits industry already struggling. *Crain's Cleveland Business*, *42*(42), 1. https://go.openathens.net/redirector/liberty.edu?url=https://www.proquest.com/trade-journals/filling-skills-gap-even-more-difficult/docview/2598682435/se-2

Roberts, R. (2020). Qualitative interview questions: Guidance for novice researchers. *Qualitative Report*, *25*(9), 3185–3203. https://doi.org/10.46743/2160-3715/2020.4640

Robson, C., & McCartan, K. (2016). *Real world research: A resource for users of social research methods in applied settings* (4th ed.). Wiley.

Rorty, R. (1991). *Contingencia, ironía y solidaridad.* Paidós.

Rossini, M., Cifone, F. D., Kassem, B., Costa, F., & Portioli-Staudacher, A. (2021). Being lean: how to shape digital transformation in the manufacturing sector. *Journal of Manufacturing Technology Management*, *32*(9), 239–259. https://doi.org/10.1108/JMTM-12-2020-0467

Rotman, D. (2023, January 9). 2022's seismic shift in US tech policy will change how we innovate. *MIT Technology Review*. https://www.technologyreview.com/2023/01/09/1064735/us-tech-policy-changing-innovation/

Sahakyan, T. (2023). Member-checking through diagrammatic elicitation: Constructing meaning with participants. *TESOL Quarterly*, *57*(2), 686–701. https://doi.org/10.1002/tesq.3210

Samai, C., & Campbell, R. (2021). Culture, teamwork and engagement: 40 years of finding the right ingredients. *Current Opinion in Cardiology*, *36*(1), 105–109. https://doi.org/10.1097/HCO.0000000000000805

Schuurman, D. C. (2019). Artificial intelligence: Discerning a Christian response. *Perspectives on Science & Christian Faith*, *71*(2), 75. https://openurl.ebsco.com/EPDB%3Agcd%3A9%3A13963241/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A136763601&crl=c

Seaton, G. A., Church, A. H., Allen, J. B., Jain, S., Dickey, J., & Guidry, B. (2021). Leadership in the time of COVID: Should we really throw the baby out with the bathwater? *Industrial and Organizational Psychology*, *14*(1–2), 117–122. https://doi.org/10.1017/iop.2021.22

Seo, K., Fels, S., Kang, M., Jung, C., & Ryu, H. (2020). Goldilocks conditions for workplace gamification: How narrative persuasion helps manufacturing workers create self-directed behaviors. *Human–Computer Interaction*, *36*(5–6), 473–510. https://doi.org/10.1080/07370024.2020.1744145

Sharma, R., Gupta, D., Maseleno, A., & Peng, S. (2022). Introduction to the special issue on big data analytics with internet of things-oriented infrastructures for future smart cities. *Expert Systems, 39*(5), 1. https://doi.org/10.1111/exsy.12969

Shen, L., Sun, C., & Ali, M. (2021). Role of servitization, digitalization, and innovation performance in manufacturing enterprises. *Sustainability (Basel, Switzerland)*, *13*(17), 9878. https://10.3390/su13179878

Soliman, A. F. (2020). The effect of leadership empowerment on technology transfer effectiveness: A proposed model: An applied study on the telecommunication companies in one of the developing countries. *Journal of High Technology Management Research*, *31*(1), 100371. https://doi.org/10.1016/j.hitech.2020.100371

Sousa-Zomer, T. T., Neely, A., & Martinez, V. (2020). Digital transforming capability and performance: A microfoundational perspective. *International Journal of Operations & Production Management*, *40*(7–8), 1095–1128. https://doi.org/10.1108/IJOPM-06-2019-0444

Spahrbier, M., Blank, D., & Ziegler, D. (2022). Supporting human monitoring activities in highly automated manufacturing through gamification. *Computers & Industrial Engineering*, *168*, 108049. https://doi.org/10.1016/j.cie.2022.108049

Spiegler, S. V., Heinecke, C., & Wagner, S. (2021). An empirical study on changing leadership in agile teams. *Empirical Software Engineering: An International Journal*, *26*(3), 1–35. https://doi.org/10.1007/s10664-021-09949-5

Spiers, J., Morse, J. M., Olson, K., Mayan, M., & Barrett, M. (2018). Reflection/commentary on a past article: "Verification strategies for establishing reliability and validity in qualitative

research". *International Journal of Qualitative Methods*, *17*(1), 1609406918788237. http://doi.org/10.1177/160940690200100202

Stornelli, A., Ozcan, S., & Simms, C. (2021). Advanced manufacturing technology adoption and innovation: A systematic literature review on barriers, enablers, and innovation types. *Research Policy*, *50*(6), 104229. https://doi.org/10.1016/j.respol.2021.104229

Stratton, S. J. (2021). Population research: Convenience sampling strategies. *Prehospital and Disaster Medicine*, *36*(4), 373–374. https://doi.org/10.1017/S1049023X21000649

Suryaningtyas, D., Sudiro, A., Troena, E. A., & Irawanto, D. W. (2019). Organization resilience and organizational performance: Examining the mediating roles of resilient leadership and organizational culture. *Academy of Strategic Management Journal*, *18*(2), 1–7. https://search.proquest.com/docview/2238485074

Szász, L., Demeter, K., Rácz, B., & Losonci, D. (2021). Industry 4.0: A review and analysis of contingency and performance effects. *Journal of Manufacturing Technology Management*, *32*(3), 667–694. https://doi.org/10.1108/JMTM-10-2019-0371

Theofanidis, D., & Fountouki, A. (2018). Limitations and delimitations in the research process. *Perioperative Nursing-Quarterly scientific, online official journal of GORNA*, *7*(3 September-December 2018), 155–163. https://doi.org/10.5281/zenodo.2552022

Tobi, H., & Kampen, J. K. (2018). Research design: The methodology for interdisciplinary research framework. *Quality & Quantity*, *52*(3), 1209–1225. https://doi.org/10.1007/s11135-017-0513-8

Torre, T., & Sarti, D. (2020). The way toward e-leadership: Some evidence from the field. *Frontiers in Psychology*, *11*, 554253. https://doi.org/10.3389/fpsyg.2020.554253

Tortorella, G., Fettermann, D., Anzanello, M., & Sawhney, R. (2017). Lean manufacturing implementation, context and behaviors of multi-level leadership. *Journal of Manufacturing Technology Management*, *28*(7), 867–891. https://doi.org/10.1108/jmtm-06-2017-0128

Tūtlys, V., & Spöttl, G. (2022). Disruption of qualifications in manufacturing: Challenges and prospects. *European Journal of Training and Development*, *46*(5–6), 390–412. https://doi.org/10.1108/EJTD-07-2020-0121

Uhl-Bien, M. (2021). *Complexity and COVID-19: Leadership and followership in a complex world*. Wiley. https://doi.org/10.1111/joms.12696

Uhl-Bien, M., & Arena, M. (2018). Leadership for organizational adaptability: A theoretical synthesis and integrative framework. *The Leadership Quarterly*, *29*(1), 89–104. https://doi.org/10.1016/j.leaqua.2017.12.009

Ulmer, J., Braun, S., Cheng, C., Dowey, S., & Wollert, J. (2023). A human factors-aware assistance system in manufacturing based on gamification and hardware modularisation. *International Journal of Production Research*, *61*(22), 7760–7775. https://doi.org/10.1080/00207543.2023.2166140

Vaisi, B. (2022). A review of optimization models and applications in robotic manufacturing systems: Industry 4.0 and beyond. *Decision Analytics Journal*, *2*, 100031. https://doi.org/10.1016/j.dajour.2022.100031

Van der Linden, N., Devos, C., Boudrenghien, G., Frenay, M., Azzi, A., Klein, O., & Galand, B. (2018). Gaining insight into doctoral persistence: Development and validation of doctorate-related need support and need satisfaction short scales. *Learning and Individual Differences*, *65*, 100–111. https://doi.org/10.1016/j.lindif.2018.03.008

van Laar, E., van Deursen, A. J. A. M., van Dijk, J. A. G. M., & de Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior, 72*, 577–588. https://doi.org/10.1016/j.chb.2017.03.010

van Manen, M., & van Manen, M. (2021). Doing phenomenological research and writing. *Qualitative Health Research, 31*(6), 1069–1082. https://doi.org/10.1177/10497323211003058

van Tuin, L., Schaufeli, W. B., van Rhenen, W., Kuiper, R. M., Taris, L., & Hoijtink, L. (2020). Methodology and statistics for the behavioural and social sciences, & work and organizational psychology: Occupational health psychology. Business results and well-being: An engaging leadership intervention study. *International Journal of Environmental Research and Public Health*, *17*(12), 1. https://doi.org/10.3390/ijerph17124515

Vasileiou, K., Barnett, J., Thorpe, S., & Young, T. (2018). Characterizing and justifying sample size sufficiency in interview-based studies: Systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology*, *18*(1), 148–165. https://doi.org/10.1186/s12874-018-0594-7

Veile, J. W., Kiel, D., Müller, J. M., & Voigt, K. (2020). Lessons learned from Industry 4.0 implementation in the German manufacturing industry. *Journal of Manufacturing Technology Management, 31*(5), 977–997. https://doi.org/10.1108/JMTM-08-2018-0270

Vrontis, D., Christofi, M., Pereira, V., Tarba, S., Makrides, A., & Trichina, E. (2022). Artificial intelligence, robotics, advanced technologies and human resource management: A systematic review. *International Journal of Human Resource Management*, *33*(6), 1237–1266. https://doi.org/10.1080/09585192.2020.1871398

Wallace, D. M., Torres, E. M., & Zaccaro, S. J. (2021). Just what do we think we are doing? Learning outcomes of leader and leadership development. *The Leadership Quarterly*, *32*(5), 101494. https://doi.org/10.1016/j.leaqua.2020.101494

Wang, Y., Toseef, M., & Gong, Y. (2021). IT process alignment in business strategy: Examining the role of transactional leadership and organization culture. *Information (Basel)*, *12*(6), 237. https://doi.org/10.3390/info12060237

Wewerka, J., & Reichert, M. (2023). Robotic process automation - A systematic mapping study and classification framework. *Enterprise Information Systems*, *17*(2), 1986862. https://doi.org/10.1080/17517575.2021.1986862

Whittemore, R., Chase, S. K., & Mandle, C. L. (2001). Validity in qualitative research. *Qualitative Health Research*, *11*(4), 522–537. https://doi.org/10.1177/104973201129119299

Yao, Y. (2021). The geometry of three-way decision. *Applied Intelligence (Dordrecht, Netherlands)*, *51*(9), 6298–6325. https://doi.org/10.1007/s10489-020-02142-z

Yeo, R. K. (2021). Know thyself. *Organizational Dynamics*, *50*(4), 100800. https://doi.org/10.1016/j.orgdyn.2020.100800

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage.

Zeba, G., Dabić, M., Čičak, M., Daim, T., & Yalcin, H. (2021). Technology mining: Artificial intelligence in manufacturing. *Technological Forecasting & Social Change*, *171*, 120971. https://doi.org/10.1016/j.techfore.2021.120971

Zeike, S., Bradbury, K., Lindert, L., & Pfaff, H. (2019). Digital leadership skills and associations with psychological well-being. *International Journal of Environmental Research and Public Health*, *16*(14), 2628. https://doi.org/10.3390/ijerph16142628

Zhang, Y., Fong, P. S., & Yamoah Agyemang, D. (2021). What should be focused on when digital transformation hits industries? Literature review of business management adaptability. *Sustainability (Basel, Switzerland*), *13*(23), 13447. https://doi.org/10.3390/su132313447

Zhao, C., Tian, G., Wen, Z., & Gao, X. (2021). Charismatic leadership and millennial employee innovation performance relationship mediated by employees' leadership, professional, and organizational identification. *Social Behavior and Personality*, *49*(1), 1–11. https://doi.org/10.2224/sbp.9643

Zhou, L., Jiang, Z., Geng, N., Niu, Y., Cui, F., Liu, K., & Qi, N. (2022). Production and operations management for intelligent manufacturing: A systematic literature review. *International Journal of Production Research*, *60*(2), 808–846. https://doi.org/10.1080/00207543.2021.2017055

Zulu, S. L., & Khosrowshahi, F. (2021). A taxonomy of digital leadership in the construction industry. *Construction Management and Economics*, *39*(7), 565–578. https://doi.org/10.1080/01446193.2021.1930080

Appendix A: Interview Guide

Interview Date_____

Gender M / F

Position _____

Age _____

Highest Degree Completed_____

Industry Sector_____

Years in Industry _____

Years of Firm Tenure _____

Firm Gross Revenue >$1M <$1M-$2.5M <$2.5-$5M <$5M-10M <$10M+

Race White / African American / Hispanic / Asian / Multi-racial

Introductory Statement

Today's interview session explores the business phenomenon that appears when rapidly emerging advanced technology creates leadership challenges. Although new technologies often improve one's ability to work more efficiently, new technologies may also introduce complexities and uncertainties for business leaders. The way in which employees address uncertainties occurs within each company's unique organizational culture and leadership approaches. Before beginning the interview, please note that the researcher protects the confidentiality of this firm and all participants per ethical guidelines and professional standards of academic research. I am committed to each participant to accurately transcribe and document this interview to ensure a truthful presentation and fair interpretation of all viewpoints. The researcher protects all participant names and identifiers during employee interactions and throughout the collection and storage of research data. These interviews will be recorded, in

which the recordings will be confidentially secured during the study and destroyed upon completion of this research study.

Interview Questions Organizational Culture

Organizational culture

1. Describe the firm's organizational culture through core values, symbols, rituals, language, stories, and how employees interact.
2. What types of individual development does the organization have for current and future people leaders?
3. What behaviors and attributes does the organization look for in its leaders?
4. How does the organization develop the behaviors and attributes its leaders desire?
5. How does the firm's culture encourage innovation and the use of new technologies to improve manufacturing productivity and new capabilities?
6. How do leaders encourage teamwork, improve competency, and support the independent thinking of employees?

Organizational Innovation

7. Who in the organization is responsible for introducing innovations into the firm, and how open are employees to adapting to uncertainties that may exist with new technologies?
8. In your opinion, does the firm embrace cutting-edge technologies, take a cautious approach to new technologies, or not consider technology a competitive advantage? Why?
9. Describe the firm's leadership climate. Are leaders genuine and able to articulate a clear vision of the firm's future?

10. How do leaders motivate and intellectually stimulate change management to new technologies? Are these efforts practical?
11. How has technology changed the way the organization works in the last decade?
12. How have new technologies increased or decreased complexity and uncertainty in your work?
13. As new technologies launch in the business, how does the organization access the practicality of these technologies?
14. What are the most critical actions and behaviors an organization can do to increase productivity and profitability?
15. Please describe the process for exploring and introducing new technologies into operations.
16. How do employees react to changes in technology?

COVID Impact

17. How did COVID affect your business?
18. What changes did you have to adjust to your leadership philosophy during COVID?

Closing Statement

Thank you for your time commitment to this conversation and the thoughtfulness of your responses as your interview adds to this study's quality and practical value. As a reminder, I am committed to each participant to accurately transcribe and document this interview to ensure a truthful presentation and fair interpretation of all viewpoints. The researcher protects all participant names and identifiers during employee interactions and throughout the collection and storage of research data. If you have any additional thoughts or desire to clarify responses, please do not hesitate to contact me to provide supplementary information.

Appendix B: Survey

Date _____

Gender M / F

Age_____

Highest education _____

Position Front-line worker or Middle-Manager or Senior Leader

Years in Industry _____

1. How would you rate how prepared your organization is to handle new technology? (Scale of 1 to 5)
2. To what extent do you think technology has enhanced the effectiveness of the organization's manufacturing process? (Scale of 1 to 5)
3. Do you feel you have the skills and training to be adaptable to future training? (Scale of 1 to 5)
4. How do you feel your business leaders are prepared to implement technology in your business sector? (Scale of 1 to 5)
5. How would you rate new technology to increase productivity in your Industry? (Scale of 1 to 5)
6. How would you rate technology's ability to make leaders more effective? (Scale of 1 to 5)
7. How does your organization use digital tools to support and enhance its leadership development programs? (Scale of 1 to 5)
8. Has automation reduced or increased decision-making complexity for manufacturing leaders regarding their ability to react quickly and accurately to changing conditions within the industry? (Reduced or Increased)

Survey Email Script

Please find the link below for a survey that will explore the business phenomenon of how rapidly emerging advanced technology creates leadership challenges in organizations. This Survey is intended to provide insight into the impact of technology on leadership skills within a manufacturing business. Thank you for your time in helping us better understand this critical issue. Your input is invaluable!

Live Link below for reference:

https://forms.office.com/Pages/ResponsePage.aspx?id=jiH4ugKzZUSpk0o5yXJRslrSo_RQFzxLifhqneJrK_1UQVhaNzVOSFU5MjA2NFVYUjFIMkNBNFY0Ri4u

Appendix C: Data Collection, Organization, and Storage Protocols

These protocols should focus on proper data collection, organization, and storage while considering the ethical considerations for managing qualitative research. That way, any collected and stored data are handled in a manner that is secure and compliant with relevant regulations. Additionally, if done correctly, this can help ensure an efficient analysis process that produces reliable results from qualitative research.

1. Qualitative data will be collected through interviews, surveys, and observations.
2. Data will be via audio recordings and field notes upon completion of each interview. Transcripts will be created of audio recordings, and fieldnotes will be converted to memos and stored securely in a digital format.
3. NVivo software to organize the collected data into categories for more accessible analysis
4. Data will regularly back up all stored files on secure servers with multiple layers of security protection to prevent potential loss or damage.
5. All data will be reviewed at least weekly to ensure any new trends are documented and reviewed.
6. Only the researcher can access the NVivo files and final organized data.
7. Monitor and review existing protocols regularly and update them as needed based on changing standards.

Appendix D: Interview Qualitative Data

Interview Date	Interview #	Gender	Leader Type	Position	Age	Highest Degree	Sector	Years in Industry	Years in Firm	Firm Gross Revenue	Race
2/20/2024	1	M	Senior Leader	Senior Vice President	66	Batchelor's	Large format Plastic products	43	34	<$10	White
2/22/2024	2	M	Senior Leader	Owner	78	High School	CNC machining and precision parts	60	51	<$1M-$2.5M	White
3/4/2024	3	M	Senior Leader	Owner	66	Masters	Aviation Parts Manufacturing	46	46	<$10	White
3/4/2024	4	M	Middle Manager	General Manager	56	Associates	Aviation Parts Manufacturing	36	4	<$10	White
3/11/2024	5	M	Senior Leader	Owner	66	Masters	CNC machining and precision parts	53	25	<$10	White
3/26/2024	6	M	Middle Manager	Director of Operations	57	Masters	Tungsten and Molybdenum Manufacturing	35	1	<$10	White
3/27/2024	7	M	Senior Leader	Sr. Plant Manager	44	Batchelor's	Speciality Chemical	22	21	<$10	White
3/28/2024	8	F	Middle Manager	Procurement Manager	35	Masters	Control Systems	12	3	<$10	White
4/6/2024	9	M	Middle Manager	Maintanence Supervisor	52	Associates	Machining - Fastners	30	15	<$10	White
4/6/2024	10	M	Middle Manager	Production Supervisor	50	High School	Machining - DoD Maritime	30	1.5	<$10	White
4/11/2024	11	M	Senior Leader	Owner	42	Batchelor's	Machining - Cam	18	6	<$5M-$10M	White
4/11/2024	12	M	Senior Leader	Owner	60	Batchelor's	Machining - Cam	38	29	<$5M-$10M	White
4/11/2024	13	M	Middle Manager	Shop Supervisor	27	Batchelor's	Machining - Cam	6	2	<$5M-$10M	White
4/11/2024	14	M	Middle Manager	Production Supervisor	59	High School	Fabrication - Commercial Kitchen	26	6	<$10	White
4/12/2024	15	M	Middle Manager	Operations Manager	42	High School	Automative Manufacturing	11	11	<$5M-$10M	White
5/1/2024	16	M	Senior Leader	Plant Manager	44	Masters	Electrical Components	15	0.25	<$10	White
5/3/2024	17	M	Middle Manager	Procurement Manager	41	Batchelor's	Chemical Manifacturing	20	4.5	<$10	White
5/14/2024	18	M	Middle Manager	Engineering Manager	42	Masters	Food and Beverage Manufacturing	20	2	<$10	White

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

November 28, 2023

Matthew Brancatelli
Patrick Cline

Re: IRB Exemption - IRB-FY23-24-402 Leadership in the Age of Advanced Technology

Dear Matthew Brancatelli, Patrick Cline,

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:104(d):

Category 2.(iii). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met:
The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by §46.111(a)(7).

For a PDF of your exemption letter, click on your study number in the My Studies card on your Cayuse dashboard. Next, click the Submissions bar beside the Study Details bar on the Study details page. Finally, click Initial under Submission Type and choose the Letters tab toward the bottom of the Submission Details page. Your information sheet and final versions of your study documents can also be found on the same page under the Attachments tab.

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,
G. Michele Baker, PhD, CIP
Administrative Chair
Research Ethics Office